



# CHEMICAL ABSTRACTS

Vol. 17.

NOVEMBER 20, 1923

No. 22

## 1—APPARATUS

C. G. DERICK

Further tests upon Dewar flasks intended to hold liquid air. HENRY BRIGGS AND JOHN MALLINSON. *Proc. Roy. Soc. Edinburgh* 43, II, 160-9(1923).—Expts. continued along the line previously reported (cf. C. A. 16, 1640) led to the following conclusions. The neck-loss of the ordinary container is negligible, and the conduction loss will also be rendered negligible by the charcoal if the pressure in the envelope is less than 0.1 mm. at room temp. Further improvement in metal flasks can only be secured by providing and maintaining more highly polished reflecting surfaces. Flasks should be reëxhausted occasionally, not so much to prevent conduction losses as to prevent tarnishing of the inner surfaces. C. C. VAN VOORHIS

Pressure regulator for the quantitative measurement of filtration rates. WERNER RATH. *Kolloid-Z.* 33, 109-11(1923).—A vacuum filter is connected with a manometer and a tube (which acts in a manner similar to a manometer) contg. a bulb of large diam. which allows a small change in the pressure of the system for a large vol. of filtrate. Owing to the small change in the pressure (0.025 cm. Hg) during the filtration, the results are more accurate than with the usual method. Results are given for the rates of filtration of kaolin and clay suspensions. C. B. EDWARDS

Apparatus for continuous precipitation by cooling. M. R. MILLER. *J. Am. Pharm. Assoc.* 11, 910-1(1922).—The app. consists of a large stoppered flask contg. the substance to be dissolved, a vessel contg. the cooled liquid, such as a graduated cylinder, and 3 tubes, 2 of which are siphons. The flask is completely filled with the solvent and is kept hot but not boiling on a water bath or hot plate. Through the stopper pass 3 tubes, one of these is a siphon the short leg of which extends just beneath the surface of the hot liquid but nearly to the bottom of the graduate which contains cold solvent. The second tube is also a siphon; the short leg extends almost to the bottom of the heated flask and just below the surface of the cold liquid. The third tube is intended to be used in filling the siphons by suction on pressure. It may be attached to a reflux condenser to prevent loss of solvent. When properly set up the hot, concd. soln. flows through the siphon from the flask to the cooling vessel, where pptn. takes place through cooling. The pptd. material falls to the bottom of the cooling vessel, where it collects until removed. It was found that the gentle current set up through the action of the 2 siphons would carry but very little of the solid material back to the flask. By means of the app. the solvent dissolves the crude material, or the desired substance from it, deposits it on being cooled and returns to the flask for further quantity—the advantages being continuous operation, economy of solvent, and the fact that no attention is required. L. E. WARREN

Automatic fractionating columns. WM. A. PETERS, JR. *Ind. Eng. Chem.* 15, 734-5(1923); cf. C. A. 16, 2561.—An automatic continuous column-still is described. The heat supplied to the still is controlled by a thermostat placed on the column-section next above the feed section. The rate of feed of soln. to the column is controlled by a regulator actuated by the pressure at the base of the column. E. H. LESLIE

The surface-tension balance. R. G. GREEN. *Ind. Eng. Chem.* 15, 1024-5(1923).—A new type of balance for the rapid *detrn.* of surface tension is described and illustrated. The app. utilizes the drop-wt. method and requires less than 5 drops of liquid to be measured. No calcs. are involved, the drop wts. are not actually detd. and the surface tension is read on a graph scale indirectly in dynes per cm. C. C. DAVIS

Electrical contacts for the bomb calorimeter. J. S. MANN. *Chemistry & Industry* 42, 913(1923); illus.

Vapor-pressure thermometer. ALFRED STOCK. *Z. Elektrochem.* 29, 354-8(1923); 1 cut.—Details are given for the construction of a vapor-pressure thermometer for low-temp. measurement. H. JERMAIN CREIGHTON

**An apparatus for electrometric titrations.** A. J. PELLING. *J. S. African Chem. Inst.* 6, 40-8(1923).—Six drawings show a satisfactory form of app. for H-ion titrations. The use of the app. in titrating mine waters is described.  
W. T. H.

**An electrical thermoregulator.** HANS WINTERSTEIN. *Kolloid-Z.* 33, 112(1923).—A Hg thermoregulator is equipped with a float riding on the Hg column. A Pt point on the float makes contact with a movable Pt plate. A metal collar on the float prevents it from sinking into the Hg tube when the temp. falls. Oxidation of the Hg is prevented. A diagram is shown.  
C. B. EDWARDS

**A simple accessory for gas generators.** L. SPIEGEL. *Ber.* 56B, 2068(1923).—To regulate the pressure and especially to prevent the loss of evolved gas through the dropping funnel, the latter is passed through the stopper in the usual manner and then fitted with a J-shaped glass tube, which is ground at the shorter end to fit the delivery end of the dropping funnel; vaseline on the ground joint aids in keeping the pieces together. The upper end of the J tube is closed at the top but has a small opening (b) on the side near the top. Before using, the dropping funnel and its accessory are filled to b. The back pressure which may be overcome by this app. depends on the dimensions of the J tube.  
N. A. LANGE

**A new apparatus suitable for the determination of organic vapors (benzene, benzine) in gases by the use of activated carbon.** R. KATTWINKEL. *Brennstoff-Chem.* 4, 179-80(1923).—The app. consists of a metal cylinder 410 X 65 mm. in size, to which is added 100 g. activated C. A measured amt. of gas is run through this cylinder and the C<sub>6</sub>H<sub>6</sub> or benzine absorbed. A connection is made from the bottom of the cylinder to a water-cooled condenser. Superheated steam at 300° is now injected into the cylinder and the absorbed vapors are driven out. The condensate from the cooler is caught in a graduated receiver. The number of cc. of the C<sub>6</sub>H<sub>6</sub> or benzine can then be read off.  
C. T. WHITE

**A new balance.** WERNER BRAUNBEK. *Z. Instrumentenk.* 43, 224-8(1923).—An illustrated description, with the mathematical principles, of the recently patented *inclination balance* (German patent 374,724).  
C. C. DAVIS

**A gas-tight stirrer.** GEO. E. HOLM AND GEO. R. GREENBANK. *Ind. Eng. Chem.* 15, 1134(1923).  
E. J. C.

A simple method of optical pyrometer calibration (PATZELT) 2.

**Acetylene generator.** R. W. MILLER. U. S. 1,466,540, Aug. 28.

**Retorts.** A. F. MACLAREN and SAFF SUPERHEAT, LTD. Brit. 198,063, Feb. 24, 1922. In a retort for the *distrn. of coal*, etc., or for *cracking heavy oils* provided with a series of pipes at different levels for the introduction of superheated steam a jacket is provided surrounding the retort and communicating with outlets therein to receive exhaust steam and distillates from the retort.

**Graphite crucible.** K. NAKAMURA. U. S. 1,466,739, Sept. 4. The side walls of a graphite crucible are formed of superposed substantially V-shaped layers of graphite which are nested together and compressed.

**Continuously operating still with inclined distilling columns.** J. P. FOSTER and A. F. MISNER. U. S. 1,466,221, Aug. 28. The still is adapted for *distg. alc. for motor fuel*.

**Distilling column for substances of high freezing points.** W. A. PETERS, JR. U. S. 1,466,411, Aug. 28. The still is adapted for *distg. camphor*.

**Catalytic apparatus.** I. W. CEDERBERG and H. M. BÄCKSTRÖM. Brit. 199,872, July 14, 1922. App. for carrying out exothermic catalytic reactions in gases, particularly the *oxidation of NH<sub>3</sub>* and the *production of SO<sub>2</sub>*.

**Apparatus for preparing metal catalysis.** W. P. SCHUCK. U. S. 1,467,397, Sept. 11. The app. is adapted for prepg. a flaky catalyst from Ni nitrate and sugar and comprises a muffle furnace to which materials to be treated may be supplied through timed measuring valves.

**Thermoelectric couple.** W. H. BRISTOL. U. S. 1,468,456, Sept. 18. An extension portion for compound thermoelectric couples is formed of stranded wire the individual strands of which are formed of metals such as Cu and a Cu-Ni alloy which have different potential values in the couple.

**Luminescent tube.** F. J. METZGER. U. S. 1,467,187, Sept. 4. Metal wool, e. g., steel wool, is used for conducting surfaces at the ends of luminescent tubes such as those filled with Ne or He.

**Capillary viscometer.** H. E. R. VOGEL. U. S. 1,467,461, Sept. 11.

**Gas-washer tower.** W. MATHESIUS. U. S. 1,467,184, Sept. 4.

**Hardness-testing device.** R. BAUMANN. U. S. 1,465,927, Aug. 28. A weight is automatically released on compression of a spring to a certain tension.

**Agitating apparatus for dissolving sodium silicate or other finely divided substances.** E. A. TAYLOR. U. S. 1,467,342, Sept. 11.

**Device for hydrogen detection.** M. ARENDT and E. V. BROWN. U. S. 1,467,911, Sept. 11. An indicating element which may be formed of palladiumized asbestos is provided with a heater to prevent atm. changes from affecting its H-indicating properties.

**Determining hydrogen in air.** P. R. BASSETT. U. S. 1,467,081, Sept. 4. A current of air to be tested is passed over an elec. conductor such as W which has an appreciable temp. resistance coeff. and the change in resistance of the conductor caused by the difference in heat cond. of air and H is utilized to det. the H content of the air. The app. is adapted for testing air in submarines.

**Apparatus for preparing combustion gases and air for drying latex or other materials.** C. E. BRADLEY and J. G. COFFIN. U. S. 1,466,443, Aug. 28.

**Evaporating and concentrating apparatus for fruit juices, alcoholic solutions or other liquids.** E. MONTI. U. S. 1,465,020, Aug. 14. Heating and expansion coils connected with a compressor are situated in an evapg. tank and a condensing tank, in the latter of which a vacuum may be maintained.

**Apparatus for drying adherent materials susceptible to scorching.** A. G. HUHN. U. S. 1,467,038, Sept. 4. Air is passed over a heater surrounding the drying chamber and thence into the drying chamber itself.

**Venting trap (liquid seal) for bottles, fermentation jugs or other receptacles.** A. KRAUSE. U. S. 1,465,013, Aug. 14.

## 2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK

**Petrus Bonus and supposed chemical forgeries.** J. M. STILLMAN. *Sci. Monthly* 17, 318-25(1923). E. J. C.

**The evolution of chemical terminology. IV. The therm.** J. F. CORCH. *Am. J. Pharm.* 95, 150-4(1923); cf. *C. A.* 16, 1520, 2799. The word "therm" has a variety of meanings as a measure of heat, the latest being 100,000 B.t.u. (adopted in England for illuminating and fuel gas). The term should be discarded or its meaning agreed upon. **V. Some alchemical terms.** *Ibid* 227-32. —An alphabetical list of old names of chem. compds. is given, with definitions. **VI. Hydroxide.** *Ibid* 533-4. —A review of the meanings of "hydroxide" in the literature shows its indefiniteness. C. concludes that it should be used to mean only an hydroxyl compd. with basic properties.

AUSTIN M. PATTERSON.

**Ostwald's work in the chemical doctrine of affinity.** SVANTE A. ARRHENIUS. *Naturwissenschaften* 11, 729-31(1923).—Historical. C. C. DAVIS.

**The crystal structure of sodium chlorate.** WILHELM KIRV. *Z. Physik* 17, 213-50 (1923).—A comprehensive study of Laue photographs leads to essentially the same conclusions and interpretation of the structure of  $\text{NaClO}_3$  as Kolkmeijer, Bijvoet and Karssen, Dickinson and Goodhue, and Vegard. G. L. CLARK

**The natural optical activity of regular crystals of sodium chloride and sodium bromate.** CARL HERMANN. *Z. Physik* 16, 103-34(1923).—The older theories of rotatory power assumed a spiral structure of the mols. Oseen and Born, especially, have expressed the belief that the optical rotatory power can be explained with the help of the well known theory of dispersion, providing only that (1) the individual oscillators are connected together, and (2) the mols. or the crystal lattice is sufficiently asymmetric. For crystals, Born traces the rotatory power to the electromagnetic effect of vibrating particles and these forces can be calcd. by a method worked out by Ewald. Observations with  $\text{NaClO}_3$  and  $\text{NaBrO}_3$  show that the optical rotation is obtained approx. by use of the Born theory. To obtain the exact rotation with both  $\text{NaClO}_3$  and  $\text{NaBrO}_3$  the Vegard model is of particular value and with  $\text{NaBrO}_3$  the models of Dickinson or Kolkmeijer also.

HARRY B. WEISER

**The arrangement of the atoms in crystals of cinnabar.** CH. MAUGUIN. *Compt. rend.* 176, 1483-6(1923).—As the result of X-ray spectrometric observations upon several faces of crystals of cinnabar, it is concluded that three molecules of  $\text{Hg}_2\text{S}$  are contained within a unit hexagonal prism for which  $a = 4.15 \text{ \AA}$  and  $c = 9.51 \text{ \AA}$ . The positions of these atoms are given as:  $\text{Hg}, ua, 0, c/3; 0, ua, 0; -ua, -ua, -c/3$  and  $\text{S}, za, 0, -c/6$ ;

$0, vu, 0; -va, -va, c/6$ . The values of  $u$  and  $v$  are indeterminate but it is considered probable that they are close to  $1/2$ .

RALPH W. G. WYCKOFF

**Simple shearing and the structure of the crystalline forms of iron.** O. MÜGGE. *Nach. Ges. Wiss. Göttingen (Math. phys. Klasse)* 1922, No. 2, 108-9; cf. *C. A.* 16, 3563.—M. shows that the results of Johnsen (*C. A.* 11, 2081) and of Westgren and Lindh (*C. A.* 15, 3812) confirm predictions of his as to the structure of  $\alpha$ -Fe crystals based on their simple shearing characteristic. The vol. increase noted in simple shearing in  $\alpha$ -Fe crystals has been observed in lesser degree in crystals of Sb, Bi and Sn.

S. K. ALLISON

**Crystallographic study of ammonium dimolybdomalate.** A. DUFFOUR. *Bull. soc. franç. mineral.* 45, 94-6 (1922).—This salt,  $2\text{NH}_4\cdot 2\text{MoO}_4 \cdot \text{C}_4\text{H}_9\text{O}_4 + 2\text{H}_2\text{O}$ , is monoclinic hemimorphic;  $a: b: c = 1.422: 1: 1.939$ ,  $\beta = 97^\circ 46'$ ; forms (001), (111), (111), (100), (010); tabular parallel to (001); perfect basal cleavage.

E. F. HOLDEN

**The properties of rhombic sulfur at high pressures and temperatures.** H. ROSE AND O. MÜGGE. *Nach. Ges. Wiss. Göttingen (Math.-physik. Klasse)* 1922, No. 2, 110-20.—Following is a partial table of results, in which  $p$  is pressure in kg./cm.<sup>2</sup>,  $t$  is temp.,  $r$  is rhombic,  $m$  is monoclinic and  $s$  means molten:

$p$	$t$	$p$	$t$
1000	139 $r$	9600	192 $r$
1000	140 $m$	9600	213 $s$
1100	129 $r$	9600	215 $r$
1100	150 $s$	9600	222 $s$
2300	164 $r$	12200	231 $r$
2300	170 $s$	12200	240 $s$
3200	171 $r$	14300	230 $r$
3200	172 $s$	14300	251 $s$
3300	189 $r$	16100	253 $r$
3300	204 $s$	16100	262 $s$
5100	195 $r$	19300	192 $r$
5100	200 $s$	19300	263 $r$
6400	190 $r$	19600	205 $r$
6400	223 $s$	19600	244 $r$
		19600	281 $s$

At the highest pressure the m. p. of rhombic S has been elevated approx.  $150^\circ$ , as compared with  $93^\circ$  for ice VI at 16,000 kg./cm.<sup>2</sup>, detd. by Bridgman, the highest previous case. The app. used was apparently a simple piston arrangement.

G. L. CLARK

**The separation of common lead into fractions of different density.** R. H. ATKINSON. *Nature* 112, 282 (1923).—The d. of Pb crystals at the end of a fractionating series was  $11.345 \pm .005$ , and that of Pb from the mother liquor was  $11.313 \pm .005$ . Stas Pb had a d. of 11.328, which persisted after granulating and remelting under KCN.

G. L. CLARK

**Thunderstorms and ozone.** W. C. REYNOLDS. *Nature* 112, 396-7 (1923).—A severe thunderstorm which passed over London on July 10 enabled R. to est. the increase, if any, of  $\text{N}_2\text{O}_4$  and  $\text{O}_3$  in the air. No appreciable increase of  $\text{N}_2\text{O}_4$  in the air during the storm was noticed. An improved method of estg.  $\text{O}_3$ , the details of which will be published later, was devised, "in which inaccuracies in the K1 method of estn., namely the interference of  $\text{SO}_2$  and serious loss of I by volatilization, were overcome by first removing the former, and then allowing the ozonized air to react on KI in the presence of a known vol. of 0.01 N  $\text{Na}_2\text{S}_2\text{O}_3$  soln., which fixes the liberated I." The proportion of  $\text{O}_3$  present a few days before the storm was 1 in 23 millions in London, but the av. amt. present 3 to 6 days after the storm was 1 in 3.2 millions.

BENJAMIN HARROW

**The equilibrium of liquid and gaseous phases of helium at low pressures.** H. KAMERLINGH ONNES. *Rec. trav. chim.* 42, 535-8 (1923).—Some preliminary results on liquid He are described here. Observations on the distn. of He and detns. of the sp. heat of liquid He lead to the conclusion that the max. of the heat of vaporization of He really exists.

E. J. WITZEMANN

**Densities of important industrial gases—a review.** M. S. BLANCHARD. *Chem. Met. Eng.* 28, 399-400 (1923).—Data have been compiled showing ds. of many industrial gases. The necessity of obtaining an accurate d. of air for comparison is pointed out. The balloon and the volumetric methods have been employed. The av. wt. of a normal l. of air is 1.29287 g. Tables show the ds. of gases very accurately detd., and of those detd. with slightly less accuracy.

W. H. BOYNTON

**Rare gases in natural gas.** CHARLES MOUREU. *J. Chem. Soc.* **123**, 1905-47 (1923).—A lecture, M. discusses the occurrence of Ar, Ne, He, Kr and Xe in the thermal gases from springs, in mine gases, in natural gases and in volcanic gases and gives the analysis of a large no. of samples. J. L. WILEY

**Gaseous combustion at high pressures. III. The energy-absorbing function and activation of nitrogen in the combustion of carbon monoxide.** W. A. BONE, D. M. NEWITT AND D. T. A. TOWNSEND. *Proc. Roy. Soc. (London)* **103A**, 205-32 (1923); cf. *C. A.* **16**, 189.—The time-pressure curve for the combustion of (1) normal H<sub>2</sub>-air and (2) CO-air mixts. (2H<sub>2</sub> + O<sub>2</sub> + 4N<sub>2</sub> and 2CO + O<sub>2</sub> + 4N<sub>2</sub>) at initial pressures of 50 atm. are radically different. Whereas in the first the pressure rises to its max. in 0.005 sec. and begins almost immediately to fall as in a typical cooling process, in the second the pressure reaches the max. only after 0.18 sec. and is thereafter maintained at the max. for a relatively long period. The first series of expts. of this paper was with the isothermal mixt. 2CO + O<sub>2</sub> + mO<sub>2</sub> + nN<sub>2</sub> ( $m + n = 4$ ) fired at the initial pressure of 50 atm. as before but with the progressive replacement of N<sub>2</sub> with its equiv. of O<sub>2</sub>. As nN<sub>2</sub> was replaced by nO<sub>2</sub> a marked acceleration of rate of attainment of max. pressure was noted together with an increasing ratio of  $P_{\text{max.}}/P_{\text{initial}}$ . Finally with the total elimination of N<sub>2</sub> the combustion curve closely resembled that of (1). Of marked interest in this series is the role of N<sub>2</sub> in retarding the rate of cooling down from the max. pressure or, in other words, in absorbing part of the energy developed during the reaction with subsequent slow liberation of heat. In the second series with 2CO + O<sub>2</sub> + mCO + nN<sub>2</sub> ( $n + m = 4$ ) fired under the same conditions, results were similar. As nCO replaced nN<sub>2</sub> the curve changed from the characteristic (2) to that of (1). It should be noted that the combustion of CO is not "slow" as compared with H<sub>2</sub>, as suggested in the previous paper, but that the retardation is the result of the "energy-absorbing" influence of N<sub>2</sub> over and above its recognized effect as a diluent; an influence, moreover, which does not affect the combustion of H<sub>2</sub>. In the third series, with monatomic argon, 2CO + O<sub>2</sub> + mA + nN<sub>2</sub> ( $n + m = 4$ ), conclusive proof was obtained that the N<sub>2</sub> effect was not one of simple diln., for with the progressive substitution of A for N<sub>2</sub> the curve again assumed the form of (1). The systems used in the fourth series were first an undil. mixt. of CO and O<sub>2</sub> in the combining proportions 2CO + O<sub>2</sub> and then 2CO + O<sub>2</sub> + nR (where  $n = 2, 4$  or 6, and R = A, CO, O<sub>2</sub> or N<sub>2</sub>) chosen with a view to studying the "chemical mass" and purely "diluent" effects of excess of CO or O<sub>2</sub> on the pressure records. With R = 6N<sub>2</sub> max. temp. was reached only after 1100 sec. Explanations of the phenomenon of "activated" N<sub>2</sub> are offered, based on Strutt's and Langmuir's theories. H. L. OLIN

**Measurement of the viscosity and surface tension of viscous liquids at high temperatures.** E. W. WASHBURN. *Rec. trav. chim.* **42**, 686-96 (1923).—The app. and methods described were devised in order to det. the relations among viscosity, temp. and compn. and among surface tension, temp. and compn. for that portion of the system soda-lime-silica, within which the common com. glasses of this type are found. The app., methods and results are illustrated and briefly described and will be published in detail by the Engineering Expt. Station of the Univ. of Ill., Urbana, Ill.

E. J. WITZENANN  
**Crystalline liquids.** WM. J. POPE. *Chemistry and Industry* **42**, 809-11 (1923).—General review and discussion. G. L. CLARK

**Cholesterol compounds.** GEORGES FRIEDEL. *Compt. rend.* **176**, 475-8 (1923); cf. *C. A.* **16**, 1527, 3243; **17**, 3267.—The addn. of very small amt. of a cholesterol compd. to a substance, such as azoxyanisole or azoxyphenetole, having a "nematic" (devoid of rotatory power) phase, imparts to the latter the characteristic properties of cholesterol substances. From a study of this type of mixts., F. concludes that the addn. of any substance, having mol. rotatory power, to a nematic substance produces the cholesterol type of structure. The rotatory power is proportional to the amt. of asymmetric substance present and as this amt. approaches zero, there is a gradual transition from the cholesterol to the nematic properties. J. A. ALMGREN

**Retrograde precipitation of salts of aromatic acids.** A. SMITS. *Z. physik. Chem.* **104**, 481-6 (1923).—It is shown that the results on this subject obtained by Ephraim (*C. A.* **17**, 912) are readily explained on the basis of the theory of allotropy.

H. JERMAINE CREIGHTON  
**Occupation density in the adsorption of silver ions by silver bromide.** K. RAJANS AND W. FRANKENBURGER. *Z. physik. Chem.* **105**, 255-72 (1923).—The adsorption of Ag ions from aAgNO<sub>3</sub> soln. of definite concn. by AgBr particles has been studied. The

total adsorbing surface of the AgBr was detd. by counting the particles of a colloidal soln. shortly before coagulation. The quantity of adsorbed ions was ascertained from the deviation of Mohr's from Gay-Lussac's titration methods. The results indicate that in the adsorption equil. with a Ag ion soln. of a concn. of  $1.8 \times 10^{-8}$  mol./l. (in the presence of  $\text{KNO}_3$ ), approx. every 4th to 10th Br ion of the AgBr surface takes up an extra Ag ion.

H. JERMAIN CREIGHTON

**Colloid chemistry practically applied.** JEROME ALEXANDER. *Oil, Paint and Drug Reporter* 103, No. 19, 21, 91; No. 22, 21, 83; No. 23, 21, 87; No. 24, 21, 42; No. 25, 21, 83; No. 27, 21, 92; 104, No. 1, 21, 87; No. 2, 21, 83; No. 3, 21; No. 4, 21, 91; No. 5, 20, 91-2 (1923).—An outline of the application of colloidal chemistry to astronomy, meteorology, agriculture, dyeing, soap, photography, bread baking, electroplating, etc., etc.

**The theory of gels. IV.** S. C. BRADFORD. *Biochem. J.* 17, 230-9 (1923); cf. *C. A.* 15, 3021.—The forces which hold gelatin and agar in soln. are the same as those that operate between other solutes and solvents, and the setting of jellies of the natural emulsoids is merely a process of cryst.

BENJAMIN HARROW

**The ceric hydroxide sol.** H. R. KRUYT AND MISS J. E. M. VAN DER MADE. *Rec. trav. chim.* 42, 277-300 (1923).—Colloidal solns. of  $\text{CeO}_2$  or  $\text{Ce}(\text{OH})_4$  were obtained by W. Blitz (*Ber.* 35, 4435 (1902)) by the dialysis of ceric ammonium nitrate, which gives the substance by hydrolysis. Fernald and Pauli (*C. A.* 11, 2856) used this sol for the study of the influence of Ra Em on colloid systems. They observed that when a 10% ceric ammonium nitrate soln. is dialyzed 4-6 days a sol is obtained which possesses a rather high viscosity (about 2-4 times that of  $\text{H}_2\text{O}$ ). When the sol is left to itself the viscosity decreases quickly at first, then more slowly and finally approaches that of  $\text{H}_2\text{O}$ . On the addn. of electrolytes to the sol after an appreciable decrease in the viscosity, there follows a large increase and the sol eventually becomes a consistent gel. In this paper the one that is viscous and inclined to gelatinize is called the "freshly dialyzed sol"; the one that has lost its viscosity by long standing or by heating for a short time, which leads to the same result, is called the "altered sol"; the 3rd type is prep'd. by the peptization of ptd.  $\text{Ce}(\text{OH})_4$  (from cerous nitrate  $\text{Ce}(\text{NO}_3)_2 + \text{NH}_4\text{OH}$ ) which was washed and oxidized in the air with HCl (Müller, *C. A.* 2, 1794) and is called the "peptization sol." The prepn. and properties of these 3 widely diverging  $\text{CeO}_2$  sols are described. The 3rd prep'd. by M.'s method is strongly acid, coagulates on warming and with electrolytes in a very irregular manner; it always contains free cerous salt. The sols prep'd. by dialysis have in general the properties found by F. and P. The altered sol, prep'd. by warming or long preservation, from its viscosity is not hydrated yet the coagulation values clearly show the influence of ion lytropy. The influence of different factors such as the temp. and the time of dialysis, the renewal of the external  $\text{H}_2\text{O}$ , the addn. of  $\text{H}_2\text{O}$ , electrolyte solns. and EtOH, resp., to the sol, on the viscosity of the sol was studied in detail. The knowledge thus obtained enables the authors to explain why F. and P. always obtained sols which did not tend to congeal spontaneously, while on the other hand their sols did. The dialyzed sol is a hydrated sol contg.  $\text{HNO}_3$  as the peptizing electrolyte. The ratio in which  $\text{HNO}_3$  and  $\text{NH}_4\text{NO}_3$  escape from the dialyzer favors the properties of the sol in the 1st instance. On the other hand, the  $\text{H}_2\text{O}$  which enters the dialyzer exercises an important influence. EtOH replaces the  $\text{H}_2\text{O}$  in the hydrated mantle when it is added. Alc. gels are then easily formed. The shrinking is a consequence of the coarsening of the primary particles of the gel.

E. J. WITZEMANN

**The differences between some colloidal properties of common and glutinous rice starch.** TETSUARO TADOKORO AND SHOICHI SATO. *J. College Agr. Hokkaido Imp. Univ.* 12, 1-65 (1923).—Glutinous rice starch granules (*A*) swell more than common ones (*B*) in I-KI soln. The swelling increases with concn. The adsorption of I by these starches does not follow Freundlich's law. *A* swells more rapidly than *B* and the increased surface adsorbs more I. Millet starches act similarly. Both *A* and *B* swell readily in NaOH and adsorb it in accordance with the law. *B* is more resistant to  $\text{H}_2\text{SO}_4$ . Both give a blue color with small amts. of I and a brown one with large amts., but less I is required to turn *A* brown. Spectroscopic examn. (pictures given) showed there was more free I with *A*, which was more readily bleached with pyridine,  $\text{Na}_2\text{S}_2\text{O}_3$ , and X-rays. I reacts rapidly with *A* but has a greater affinity for *B*. The blue color with the latter is more intense. Neutral and alk. solns. of *A* had higher viscosities than those of *B*. Solns made from *A* had higher water retention but the change in viscosity on syneresis was greater. They were difficultly coagulated with either H ions or metal salts, while sols from *B* were readily coagulated. The change in surface tension with the latter was proportional to the tannin added, but with the former changed suddenly. Solns of *A* had higher gold nos. The degree and velocity of dehydration of gels made

from *A* were greater. NaOH, CaCl<sub>2</sub>, and FeCl<sub>3</sub> peptized the gels. The glutinous gel under the ultramicroscope appears to have a compact network structure with thick walls and is dominated by the solid phase. The common gel has a thin walled, foam-like appearance with the water phase dominant. X-rays penetrate the latter readily and the former weakly. Charcoal made from either the glutinous gels or grannies is much more adsorptive than that from the common ones. The glutinous starch sol is more highly dispersed. The reaction of starch with I is an adsorption phenomenon (cf. Euler, *et al.*, *C. A.* 16, 4110, 4111). Variations in surface and gel structure are responsible for the differences in adsorption. Both forms of rice starch are electronegative.

W.M. STERICKER

**The adsorption of organic and inorganic colloidal electrolytes.** M. A. RAKUZIN. *J. Russ. Phys. Chem. Soc.* 53, 1, 357-68(1921).—Solns. of a typical org. electrolyte, gum arabic, were treated in the cold with animal charcoal without any adsorption taking place. Al(OH)<sub>3</sub> on the other hand adsorbed irreversibly 44% of the gum arabic after 48 hrs. This leads R. to assume that gum arabic yields in aq. soln. an electrolyte and a nonelectrolytic substance, of which the former alone is adsorbed by the Al(OH)<sub>3</sub>. As inorg. colloids, solns. of K<sub>2</sub>SiO<sub>3</sub> and Na<sub>2</sub>SiF<sub>6</sub> were chosen. These gave reversible adsorption reactions with animal charcoal, colloidal SiO<sub>2</sub> and with Al(OH)<sub>3</sub>, the adsorbed salts being partly recoverable by boiling H<sub>2</sub>O. The failure of these salts to yield irreversible adsorptions is ascribed to their electrolytic dissociation in soln. New tables of elec. cond. of solns. of gum arabic, K<sub>2</sub>SiO<sub>3</sub> and of Na<sub>2</sub>SiF<sub>6</sub> at various concns. and temps. are given. W.A. PERLZWIG

**The influence of the velocity of agitation on the solution of magnesium in acids.** M. TZENTNERSWER. *Rec. trav. chim.* 42, 579-81(1923).—The expts. made to det. the velocity of dissolution of Mg in 1/4 N HCl showed that the reaction const. increases proportionally to the velocity of rotation. The dissolution takes place more rapidly when the solid phase moves with respect to the liquid phase. E.J. WITZEMANN

**Kinetic theory of the laws of osmotic pressure of strong electrolytes.** P. DRIJVE. *Rec. trav. chim.* 42, 597-604(1923).—Strong electrolytes are completely dissociated at all degrees of concn. The deviations observed for the "limit laws" (lois limites) may be attributed to elec. forces between the ions themselves and between the ions and the mols. of the solvent. These two theses may to-day be affirmed with a probability approaching certainty. D. has previously calcd. the potential energy of an electrolyte in soln. on this basis (*C. A.* 17, 2665). In the present paper D. has calcd. the osmotic pressure, using exclusively reasoning of the kinetic order and this method was found to be simpler. For mathematical details see the original. E.J. WITZEMANN

**A new method of determining the hydration of ions.** The hydration of the lithium ion. GEORGE BABOROVSKY. *Rec. trav. chim.* 42, 223-33(1923).—The problem of the hydration of ions has not been satisfactorily solved although most authors (cf. extensive bibliography) treat it from the theoretical point of view as if the exptl. part were completed. On the contrary nearly all expts. of a quant. character have been carried out by the method suggested by Nernst: An aq. soln. of a certain electrolyte is electrolyzed and the transference is detd. in the presence of an adequate nonelectrolyte, which must not take part in the transport of electricity. From the change in concn. of the non-electrolyte the amt. of H<sub>2</sub>O transported, by the passage of certain amts. of electricity, is detd. But to find a suitable nonelectrolyte is not easy. Remy (*C. A.* 9, 1569, 1869) used changes in vol. during electrolysis to measure hydration. B. (*Chem. Listy*, 11, 238(1917)) has found the operation of weighing preferable to the measurements of differences in vol. and has modified R.'s method. In this 1st expt. (B. and Miss Hanak, *Chem. Listy* 15, 3(1921)) used an app. composed of 4 U-tubes connected by 3 suction tubes. For a description of the app. for detg. the transport no. and hydration of ions and the results obtained see *C. A.* 17, 1573. *Ibid.* 533-4.—Owing to an error in calcg. the hydration of the Li ion according to the above (see *C. A.* 17, 1573) the results should have been 17.7 mols. H<sub>2</sub>O on the assumption that no H<sub>2</sub>O is attached to Cl. The results in the above paper when corrected show that about 22 mols. of H<sub>2</sub>O combine with the Li ion upon the assumption that the Cl ion is not hydrated. E.J.W.

**Piezoechemical studies. XXI. Calculation of compressibility coefficients.** A. L. TH. MOESVELD. *Z. physik. Chem.* 105, 442-9(1923); cf. *C. A.* 17, 2528.—A mathematical paper in which an equation is deduced in which the compressibility is expressed as a function of the pressure. **XXII. Compressibility of alcohol-water mixtures.** *Ibid.* 450-4.—The mean compressibilities of different mixts. of alc. and H<sub>2</sub>O at 25.00° have been detd. between 0 and 1500 atm. pressure. **XXIII. Influence of the pressure on the reaction velocity in homogeneous liquid systems. V. In liquid mixtures.** *Ibid.* 455-71.—The velocity of the reaction between NaOH (0.07 N) and the ethyl ester of

*o*-methoxycinnamic acid (0.01 N) in 31% and in 42.5% EtOH has been detd. at 25°. The velocity increases very markedly in both media, if the pressure is increased. At 1500 atm. pressure, the velocity const. is 2.34 and 2.15 times greater than at 1 atm. pressure. In 31% EtOH the pressure coeff. of the reaction velocity increases rapidly with the pressure.

H. JERMAIN CREIGHTON

The validity of the partition law in the equilibrium between mixed crystals and their solutions. G. MEYER. *Rec. trav. chim.* 42, 301-16 (1923).—M.'s purpose was to decide whether the law of partition is applicable to the equil. between a mixed cryst. phase and the co-existent soln., and whether it is possible to draw conclusions concerning the mol. state of the constituent that exists in the dil. state in the solid phase and in the soln. After the historical review expts. on the 1st topic are described. The systems  $K_2CrO_4-K_2SO_4-H_2O$ ,  $PbCl_2-PbBr_2-H_2O$  and  $p-C_6H_4Cl_2-p-C_6H_4Br_2-H_2O$  were investigated. It is concluded that although the decisive proof of the validity of the law of partition in the systems composed of 2 salts and of  $H_2O$  was not obtained, it is nevertheless probable that in these systems also the partition coeff. of solid soln. has a const. value for small concns. For the system of org. compds. examd. the validity of the partition law was demonstrated with certainty. In the system  $K_2CrO_4-K_2SO_4-H_2O$  and also in  $p-C_6H_4Cl_2-p-C_6H_4Br_2-H_2O$  the partition coeff. was found to be const. only if it is admitted that the dissolved substance has the same mol. constitution in the soln. and in the solid phase. In the latter part of the paper the question is discussed as to whether it is possible to draw conclusion concerning the size of the mol. in solid state from the form in which the partition law appears. It is concluded that it is only in well detd. cases and by means of hypotheses here given that the study of these equil. of partition permit of detg. something concerning the internal structure of mixed crystals.

E. J. WITZEMANN

Studies on catalysis in homogeneous gas reactions. I. Catalysis of the formation of nitrosyl chloride with bromine. A. KISS. *Rec. trav. chim.* 42, 112-44 (1923).—The catalysis of NOCl formation with Br takes place by way of NOBr as an intermediate product. The velocity of formation of NOCl from NOBr and  $Cl_2$  at 0° to 100° was measured. This reaction was found to be a genuine very rapid gas reaction of the 3rd order, accelerated by  $H_2O$ . The formation of NOCl in the absence of Br is not catalyzed by  $H_2O$  at 18°. In agreement with the radiation theory of reaction velocity the reaction for the formation of NOCl from  $NO + Cl_2$  and from  $NOBr + Cl_2$  is not sensitive to light. The formation of NOCl from  $NO + Cl_2$  is catalyzed by rough surfaces by the development of a surface reaction. It was found that HCl and  $CO_2$  and in the dark  $H_2$  and CO acting as indifferent gases do not change the velocity of NOCl formation. The velocity of NOCl formation from  $NOBr + Cl_2$  is not changed by the indifferent gas  $CO_2$ . These results showed that the catalysis of the homogeneous gas reaction investigated is a chem. or intermediate-reaction catalysis. E. J. W.

Catalytic decomposition of sodium hypochlorite by cobalt peroxide. O. R. HOWELL. *Proc. Roy. Soc. (London)* 104A, 134-52 (1923).—An investigation has been made of the rate of evolution of O from a soln. of NaOCl in the presence of a suspension of  $Co_2$ . The value of the sp. reaction const.  $k$  is given for a wide range of concns. of  $Co_2$ ,  $k$  being directly proportional to the amt. of catalyst added. The value of  $k$  is more const. for lower than for higher values of the added  $Co_2$ . The effectiveness of the catalyst is shown to decrease upon repeated use but is not impaired by any of the common poisons. NaCl in increasing concns. causes an increase in the value of  $k$  directly proportional to the square root of the total Na-ion concn. This is explained by the equation:  $Co:O:O + NaOCl \rightarrow Co:O(OCl)ONa \rightarrow CoO + O_2 + NaCl$  the Co : O : O being regenerated by the O. Increase in the Na ion would cause an increase in the rate of adsorption of the NaOCl and a corresponding increase in the rate of O evolution. The opposite is true of increase in the concn. of NaOH, which tends to form the more stable  $Co(OH)ONa$  to the exclusion of  $Co:O(OCl)ONa$ . These explanations are verified by the presentation of many data. The temp. coeff. for 10° C. is 2.37. The value of  $E$  in the Arrhenius equation  $\ln K_{T_2}/K_{T_1} = (E/R)[(1/T_1) - (1/T_2)]$  is 16.574. The reaction is one of the first order.

C. R. PARK

Normal and acid sulfates of sodium. P. PASCAL AND ERO. *Mem. poudres* 20, 1-16 (1923).—The system  $Na_2SO_4-H_2SO_4-H_2O$  was studied. The following salts are in equil. with the liquid phase at various concns. and temps.:  $Na_2SO_4$ ;  $Na_2SO_4 \cdot 7H_2O$ ;  $Na_2SO_4 \cdot 10H_2O$ ;  $Na_2SO_4 \cdot NaHSO_4$ ;  $NaHSO_4$ ;  $NaHSO_4 \cdot H_2SO_4$ ;  $NaHSO_4 \cdot H_2SO_4 \cdot 1.5H_2O$ ;  $2NaHSO_4 \cdot Na_2SO_4$ . The solv. of  $Na_2SO_4$  in  $H_2SO_4$  of different concns. was detd. at different temps. below 120°, and the liquid and solid phases were analyzed when equil. had been attained. Further points on the diagram were obtained by observing the temps. at which solid began to be deposited from solns. of known compn. Finally, the form of the isothermals was definitely fixed by thermal analysis.  $NaHSO_4$  melts

at 185° and its monohydrate at 112°. The salts  $\text{NaHSO}_4 \cdot \text{H}_2\text{SO}_4$  and  $\text{NaHSO}_4 \cdot \text{H}_2\text{SO}_4 \cdot 1 \cdot 5\text{H}_2\text{O}$  have no definite m. ps. The former is liquid above 107.5° and the latter at 131°. The salt  $\text{NaHSO}_4 \cdot \text{Na}_2\text{SO}_4$  decomposes at 171° and partly liquifies with deposition of the neutral anhyd. sulfate. Isotherms with 25° intervals are given for this system on a triangular diagram, and a further diagram gives the regions of stability of the various salts enumerated above. Solns. of pure  $\text{NaHSO}_4$  in  $\text{H}_2\text{O}$  can only deposit the normal decahydrate above 4°, while at room temp. they can only give the salt  $\text{NaHSO}_4 \cdot \text{Na}_2\text{SO}_4$ . In order to obtain crystals of the pure  $\text{NaHSO}_4$  it is essential to have a considerable amt. of acid in the soln.; certain deposition of  $\text{NaHSO}_4$  can only be obtained from 65%  $\text{H}_2\text{SO}_4$ . Compds. of  $\text{NaHSO}_4$  and  $\text{H}_2\text{SO}_4$  are only deposited from  $\text{H}_2\text{SO}_4$  solns. above 80%. It is impossible to obtain the salt  $\text{NaHSO}_4 \cdot \text{H}_2\text{SO}_4$  from aq. soln. The processes for obtaining  $\text{H}_2\text{SO}_4$  by the hydrolysis of  $\text{NaHSO}_4$  are reviewed from the point of view of the diagrams obtained. The whole acidity of the bisulfite may be obtained as  $\text{H}_2\text{SO}_4$  by depositing the decahydrate from comparatively dil. soln. with the aid of refrigeration, or the intermediate salt may be deposited from more concd. solns. without recourse to refrigeration. In the latter case, the whole of the acidity is not recovered as  $\text{H}_2\text{SO}_4$ . The two methods are analyzed with the aid of a further triangular diagram. A diagram of the m. ps. of mixts. of  $\text{Na}_2\text{SO}_4$  with  $\text{H}_2\text{SO}_4$  is given. J. C. S.

**The heterogeneous equilibria in the system: sodium sulfate, sodium chromate and water.** YUKICHI OSAKA. *Rec. trav. chim.* 42, 594 (1923).—The results are given mainly in the form of diagrams for which see the original. (Cf. also Osaka and Yoshida, *C. A.* 17, 1181.) E. J. WITZEMANN

**Perborates.** The taking up of hydrogen peroxide by boric acid and borate ions and the dissociation constant of perboric acid. HEINRICH MENZEL. *Z. physik. Chem.* 105, 402-41 (1923).—By means of f. p. and cond. measurements at 0°, it has been shown that a union of  $\text{H}_2\text{O}_2$  and  $\text{H}_3\text{BO}_3$  does not take place in aq. soln., and that therefore the decompn. const. of perboric acid,  $K_{\text{decomp.}} = [\text{H}_2\text{O}_2][\text{H}_3\text{BO}_3]/[\text{H}_3\text{BO}_3 \cdot \text{H}_2\text{O}_2]$ , must be very large. The influence of the addn. of various quantities of  $\text{H}_2\text{O}_2$  on the apparent equiv. cond. of metaborate and borax solns. of different concns. has been studied. With increasing salt concn. and the amt. of  $\text{H}_2\text{O}_2$  added to the solns., the cond. is steadily depressed, probably because of the formation of various addn. products with small degrees of hydrolysis and ionic mobilities. The results of cryoscopic measurements with borax and metaborate solns. contg.  $\text{H}_2\text{O}_2$  indicate that both the metaborate ion and the complex ion present in concd. borax solns. are able to combine with  $\text{H}_2\text{O}_2$ ; that at higher metaborate concns. there occurs, together with  $\text{H}_2\text{O}_2$  union, a polymerization of the simple ions, and at the same time the osmotic concn. of the mixt. becomes smaller. The addn. of  $\text{H}_2\text{O}_2$  to borate ions has been demonstrated by means of partition expts. with  $\text{AmOH}$ . The results of these measurements together with those of f.p. measurements indicate that in 0.02 to 0.07 mol. metaborate- $\text{H}_2\text{O}_2$  a simple ion  $(\text{BO}_3 \cdot \text{H}_2\text{O}_2)^-$  exists in equil. with free metaborate and free  $\text{H}_2\text{O}_2$ , while in concd. solns. polymerization occurs and more than one  $\text{H}_2\text{O}_2$  mol. can be attached to one B atom. For the simple acid ( $\text{H}_3\text{BO}_3$ ,  $\text{H}_2\text{O}_2$ ) and the ion  $(\text{BO}_3 \cdot \text{H}_2\text{O}_2)^-$ , the ratio of the decompn. const. of the perboric acid to that of its ion is equal to the ratio of the dissoci. const. of the perboric acid to that of its ion. For the equil.  $\text{H}^+ + (\text{BO}_3 \cdot \text{H}_2\text{O}_2)^- \rightleftharpoons \text{HBO}_2 + \text{H}_2\text{O}_2$ , the following expression has been deduced for the apparent dissoci. const. of the perboric acid:  $K_p' = [\text{H}^+]^{[(\text{BO}_3 \cdot \text{H}_2\text{O}_2)^-]}/[\text{HBO}_2][\text{H}_2\text{O}_2]$ . From the partition measurements the decompn. const. of the perboric acid is  $2.4 \times 10^{-2}$  at 0° and  $3.3 \times 10^{-3}$  at 18°, according to which the apparent dissoci. const. is  $> 1 \times 10^{-8}$  at 0° and about  $1.7 \times 10^{-8}$  at 18°. H. JERMAIN CREIGHTON

**Heterogeneous equilibrium resulting from the hydrolysis of bismuth chloride.** KARL JELLINEK AND WALTER KÜHN. *Z. physik. Chem.* 105, 337-55 (1923).—An analytical method is worked out and described for the detn. of Bi and Cl. The solv. curves of the ternary system  $\text{Bi}_2\text{O}_3$ ,  $\text{HCl}$  and  $\text{H}_2\text{O}$  have been established. In certain solns.  $\text{BiOCl}$  is the solid phase, in others a bismuthyl hydroxide. In the presence of alkali the solid phase  $\text{BiOCl}$  is quantitatively converted into a bismuthyl hydroxide. The normal potential of Bi has been measured against the normal  $\text{H}_2$  electrode and the value + 0.226 v. at 18.5° obtained. The concns. of the  $\text{H}^+$ ,  $\text{Cl}^-$  and  $\text{Bi}^{+++}$  ions in  $\text{HCl}$  solns. satd. with  $\text{BiOCl}$  have been measured, and it has been shown that the law of mass action holds for the reaction  $\text{Bi}^{+++} + \text{H}_2\text{O} + \text{Cl}^- \rightleftharpoons \text{BiOCl} + 2\text{H}^+$ . Evidence has been obtained which indicates the probable existence of a complex hydrochloride of Bi.

H. JERMAIN CREIGHTON

**Theoretical investigations of the mutual transformation of phases.** A. V. RAKOVSKII. *Nach. Phys. Chem. Lomonosow-Ges. Moskow* 2, No. 2, 37-88; *Chem. Zentr.* 1922, III, 1365.—A discussion of present theories of the transformation of phases.

None is satisfactory, because they cannot be proved or disproved exptly.

C. C. DAVIS

**The passage of condensed ternary systems through a nonvariant four-phase equilibrium with change of temperature.** W. GUERTLER. *Rec. trav. chim.* **42**, 574-8 (1923).—Theoretical discussion.

E. J. WITZEMANN

**Modern electrical pyrometry.** DAVID BROWNLEE. *Chem. Trade J.* **73**, 213-6 (1923).—A very elementary account. The comparative simplicity and relative cheapness of recording pyrometers are emphasized.

W. P. WHITE

**A simple method of optical pyrometer calibration.** FR. PATZELT. *Z. Physik* **15**, 409-12 (1923).—The positive crater of the carbon arc can, like various standard combustion lamps, be used as a standard of luminous intensity and therefore, with optical pyrometers, of effective temp. To this end it is necessary that the carbon should be of definite purity, and the current between 0.2 and 0.5 amp./mm.<sup>2</sup> A very pure carbon is naturally best. A pure carbon (mark "A" of Gebruder Siemens & Co., 6 mm. in diam., with 15 amps.) gives a "black temp." of 3780° K. Errors may come from inaccurate optical arrangements, from impurity, and from the photometric adjustment.

W. P. WHITE

**The thermal data of condensed hydrogen.** FRANZ SIMON AND FRITZ LANGE. *Z. Physik* **15**, 312-21 (1923).—Data for the region between the temp. reached with liquid H, about 14° K., and 9° K. are of great theoretical importance. The authors describe an app., almost absurdly simple, to judge from their figure, for doing calorimetry down to 9° K., well below the f. p. of H. The thin Cu aneroid calorimeter is inclosed in a Cu vacuum case, immersed in liquid H, and itself communicates by a fine metal tube with a pump and pressure-measuring system. The test sample is cooled by distg. H into the calorimeter and then pumping some of it out, and only the calorimeter has to be cooled to the lowest temp. The temp. is measured by means of the v. p. of the (solid) H, and after the expt. the H is pumped out and measured to give a correction for its heat capacity during the run. An elec. heater is used. The worst final precision estd. is to 1.5%. It was to get data for the corrections in this work that the authors studied the sp. heats of liquid and solid H, and the latent heat of melting and vaporization, using the calorimeter installation as app. A table is given for the sp. heat. The molar heat of melting is  $28.0 \pm 0.15$  cal. The molar heat capacity of liquid H is  $0.33 + 0.206T$ , in good agreement with Eucken, but not with Keesom. The heat of vaporization is:  $219.7 - 0.27(T - 16.6)^2$ , showing a max. as theory demands. The molar heat of solid H can be obtained by a Debye function with  $\beta_v = 91$ .

W. P. WHITE

**Calorimetric researches. III. Some remarks on an attempt of Swientoslawski to calculate the heat of combustion of benzoic acid by a semi-theoretical method.** P. E. VERKADE. *Rec. trav. chim.* **42**, 105-11 (1923); cf. *C. A.* **16**, 3796.—Some years ago Swientoslawski found the following low value for the isothermal heat of combustion of BzOH: 6313 cal. per g. (air). From later reports including S.'s and from V.'s measurements, it has been shown that this value is certainly too low. Moreover S. tried to show by semitheoretical considerations that the value 6311 cal. (vacuum) must be very near the actual heat of combustion of BzOH. In this paper besides some smaller errors, the principal error in this reasoning has been demonstrated. There is no question here of the calcn. of the heat of combustion of BzOH; S. has only worked backwards on his own results. It was desirable to prove this, since BzOH is accepted as the calorimetric standard substance with a heat of combustion of 6324 cal. (air), which is about 0.2% higher than that given by S. **IV. Determination of the heat of combustion of cane sugar; a research as to the suitability of this substance for a thermochemical standard.** P. E. VERKADE AND J. COOPS, JR. *Ibid* 205-8.—A calorimetric system was calibrated by burning BzOH and naphthalene. The results of the combustions confirm the ratio of the heats. of combustion of these 2 compds. given in a previous paper (*C. A.* **16**, 3578): naphthalene/BzOH = 15.204 (air). Assuming that the heat of combustion of BzOH is 6324 cal. (air), then combustion of sucrose in this calorimetric system gave 3946 cal. (air) for the heat of combustion of this substance, i. e., 3944 cal. (vacuum). Some of the com. sugar preprns. for calorimetric purposes (having a definite heat of combustion) were investigated and with the exception of that obtained from the Bureau of Standards at Washington, they were found to be unsuitable as standard substances, only the latter sample can therefore be recommended for the subsequent calibration of calorimetric systems. A method is also described for prep. sufficiently pure sugar. From the heats of combustion of BzOH, naphthalene and sucrose it follows that BzOH/sucrose = 1.6025 (air), naphthalene/sucrose = 2.4362 (air). From a review of the literature it is shown that probably these ratios may be considered absolutely correct since they agree perfectly with the results of the recent investigations by Dickinson,

**Swientoslawski and Miss Starczewska and Schläpfer.** Contrary to opinions in the literature it appeared that sugar may be obtained quite pure and dry without difficulty. Sugar is practically non-hygroscopic, and may be made into good sound pellets without much difficulty. The objection of Roth (*C. A.*, 9, 995) that sugar pellets are liable to be blown away in part during the filling of the bomb with O was not encountered with good hard-pressed pellets. The no. of failures in burning sugar are always larger than when BzOH or naphthalene is used. Several methods for the combustion of sugar as pellets and as powder are given. By the use of these methods the chance for success in combustion is increased. Owing to these failures sucrose is not to be recommended, either for the calibration of a calorimetric system or as an auxiliary standard substance next to BzOH.

E. J. WITZEMANN

**Measurement of thermal conductivities.** EZZER GRIFFITHS AND G. W. C. KAYE. *Proc. Roy. Soc. (London)* 104A, 71–98 (1923). Three kinds of app. of the "plate" type are described for the rapid precision detn. of thermal cond. of materials of low cond. Although many data are given for timber, building materials, fabric, etc., the article is mostly concerned with the development of the technic.

C. R. PARK

**Thermal conductivities of metal crystals.** I. BISMUTH, G. W. C. KAYE AND J. KIRTH ROBERTS. *Proc. Roy. Soc. (London)* 104A, 98–114 (1923). A "plate" app. has been devised which is suitable for the measurement of thermal condns. as high as 0.02 c. g. s. units with an accuracy of about 1%. All measurements were previously made on bars of heterogeneous crystals. A plate of a single crystal of Bi has been used in these measurements and the cond. has been detd. in directions parallel with (0.0150) and perpendicular (0.0221) to the trigonal axis. A random distribution of crystals should give a mean value of 0.0195, which agrees well with previous measurements.

C. R. PARK

**Specific heats of sulfuric and nitric acids and of their mixtures.** P. PASCAL AND GARNIER. *Mem. poudres* 20, 29–38 (1923).—The sp. heats of binary mixts. of H<sub>2</sub>SO<sub>4</sub> and HNO<sub>3</sub> with H<sub>2</sub>O and of ternary mixts. of these 3 components were detd. by heating the liquids electrically by means of a Pt cylinder 0.01 mm. thick, in a thin glass vessel silvered on its external surface and supported inside a Dewar flask. The method of regulating the app. and of detg. the correction for loss of heat under various conditions is described. The sp. heats of mixts. of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>O at 20° varied from 0.916 for 10% H<sub>2</sub>SO<sub>4</sub> to 0.335 for 100% H<sub>2</sub>SO<sub>4</sub>; the sp. heats of mixts. of HNO<sub>3</sub> and H<sub>2</sub>O from 0.900 for 10% HNO<sub>3</sub> to 0.344 for 90% HNO<sub>3</sub>. The effect of NO<sub>2</sub> is quite noticeable; a mixt. contg. 40% HNO<sub>3</sub>, 60% H<sub>2</sub>O has a sp. heat of 0.669, as compared with 0.402 for a mixt. contg. 40% HNO<sub>3</sub>, 58.5% H<sub>2</sub>O, 1.5% NO<sub>2</sub>. The results for a large no. of mixts. of H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub> and H<sub>2</sub>O are plotted on a ternary diagram.

C. G. STORM

**The theory of the temperature variation of the specific heat of hydrogen.** E. C. KEMBLE AND J. H. VAN VLECK. *Phys. Rev.* 21, 633–641 (1923). Theoretical. To account for the abnormally large sp. heat of H at high temps. the mol. is assumed to have an internal vibrational degree of freedom and the change in mol. dimensions owing to centrifugal force is taken account of. A law of force between the atoms is set up to satisfy some properties of the gas, namely  $F = a(r - r_0)/r^3$ , where  $r$  is the distance between the at. nuclei,  $r_0$  its equil. value and  $a$  a const. Satisfactory agreement is obtained with expt. to 1300° K. The equation adjusted for this gives the following consts. of the mol.: Nuclear spacing  $0.488 \times 10^{-8}$  cm.; moment of inertia  $1.975 \times 10^{-4}$  g. cm.<sup>2</sup>; wave length of normal vibration  $2.05\mu$ . A revision of Pier's data for H gives excellent agreement with the formulas derived theoretically, which are: 0° to 2300° for H,  $C_v = 4.87 + 0.539 \times 10^{-3} t + 0.146 \times 10^{-5} t^2$ ; for H<sub>2</sub>O,  $C_v = 6.03 + 4.2 \times 10^{-3} t - 4.0710^{-6} t^2 + 1.95 \times 10^{-8} t^3$ . The discrepancy even at 2000° K. is only 0.27 cal./mol. between Pier's results and the authors' theoretical curve.

W. P. WHIRRE

**Specific heats of air, steam and carbon dioxide.** W. D. WOMERSLEY. *Proc. Roy. Soc. (London)* 103A, 183–4 (1923).—A rather complete attempt to refute the unfavorable criticisms of Glazebrook (*C. A.* 16, 1898) on W.'s paper (*C. A.* 16, 1692).

W. P. WHIRRE

**New equations to determine the specific heats of dry saturated vapors and liquids at the boiling point with applications to carbon dioxide and air.** V. FISCHER. *Z. tech. Physik* 4, 29–36 (1923); *Science Abstracts* 26A, 481.—F. deduces equations for calcg.  $C_p$  and  $C_v$  for a dry satd. vapor and for the liquid at its b. p. by considering elementary cycles on a  $p-v$  diagram. The boundary curve sepns. the satd. vapor state from the gaseous and liquid states is drawn, and cycles are taken on the right- and left-hand branches of this curve forming diagonals of the cyclic figures. For the const.-pressure sp. heats the cycle consists of 2 changes at const. pres-ure, a change at const. vol., and two with const. internal energy. The equations thus obtained are

used to calc. the sp. heats of  $\text{CO}_2$  and air, and the values so obtained are in fair agreement with those deduced from other equations. H. G.

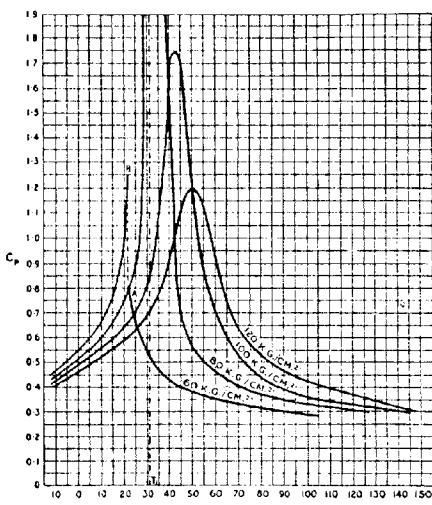
**Calculation of the specific heats of dry saturated vapors and liquids at the boiling point.** V. FISCHER. *Z. tech. Physik* 4, 72-6(1923); *Science Abstracts* 26A, 481-2.—In this paper, which supplements a previous contribution (see preceding abstr.) F. shows that an equation given in Planck's "Thermodynamics," *viz.*,  $c_{p_s} - c_{p_0} = dr/dT - \gamma/T_s + r/s - \alpha((\partial r_s/\partial T)_p - (\partial r_v/\partial T)_p)$  and which is often used for calcg. the sp. heat of a dry satd. vapor ( $c_{p_s}$ ), is the difference of 2 equations, the 1 involving  $c_{p_s}$ , the other  $c_{p_0}$ , the sp. heat of the liquid at the b. p., either of which suffices for calcg. these quantities. Analogous equations for the const.-vol. sp. heats are also derived and a no. of general relations between these sp. heats. H. G.

**Determination of the specific heats at the same constant pressure for the liquid and gaseous states of a substance.** V. FISCHER. *Z. tech. Physik* 4, 27-9(1923); *Science Abstracts* 26A, 482.—If a series of isotherms for unit temp. difference be drawn on a "Total Heat" ( $J$ ) diagram and these be cut by an isobar, the increment of  $J$  in passing along the isobar between two consecutive isotherms is the sp. heat at const. pressure ( $c_p$ ) at their mean temp. Or, if on a ( $J, p$ ) diagram isotherms be drawn, the intercept on an isobar between consecutive isotherms is  $c_p$ . From a Mollier  $JS$  diagram for  $\text{CO}_2$ , F. calcs. in this manner the values of  $c_p$  at different temps. and constructs as in the figure a  $c_p - t$  diagram for isobars above and below the critical pressure. It will be seen from this that the isobars for pressures exceeding the critical pressure are continuous and show a max. value for  $c_p$ , which max. is smaller the greater the pressure. The isobars below the critical pressure are discontinuous at the passage from the gaseous to the liquid state. The point A corresponds to the sp. heat of the dry satd. vapor, B to that of the liquid at the b. p.

For the same temp., the value of  $c_p$  for the gaseous state increases with the pressure, but for the liquid state  $c_p$  diminishes with rise of pressure. F. also shows how from the isobars on a  $c_p - t$  diagram the isotherms for a  $J, p$  diagram may be obtained. H. G.

**Temperature of the vapor arising from a solution.** K. SCHREBER. *Z. tech. Physik* 4, 19-27(1923); *Science Abstracts* 26A, 488.—Faraday's assertion in 1822 that the temp. of the vapor arising from a boiling soln. was that of the solvent boiling under the same pressure was a matter for controversy and expt. among certain physicists of the last century. This arose through the difficulty of conception of a discontinuity of temp. at the surface sepg. the soln. from the vapor and the lack of exptl. precautions to eliminate possible errors in the observation of the temp. of the vapor. S. discusses these points and accounts for the temp. discontinuity on thermodynamic reasoning when the existence of an osmotic pressure is recognized. He describes an app. he has used to det. the temp. of the vapor, in which the various possible sources of error are eliminated and Faraday's assertion is experimentally established. H. G.

**The heat transfer number of Nusselt and its valid range.** ALFRED SCHACK. *Stahl u. Eisen* 43, 942-6(1923).—The av. cross-sectional temp. differs from the av. true gas temp. in the same cross-section of a gas stream in a tube as shown by the equation  $t_0 - t_0' = (1/2)(t_A - t_W)$ , in which  $t_A$  is the gas temp. at the axis of the tube and  $t_W$  is the temp. of the wall of the tube. While Nusselt (*C. A.* 5, 2208) measured neither of



these temps., that which he did measure must have been near the true gas temp.; his final results are in error less than  $\pm 2\%$ . To measure the amt. of heat the temp.-measuring instrument should be distant  $\frac{1}{4}$  the diam. from the wall of the tube and should be protected from radiation from the wall. The values found by Nusselt are not applicable to conditions very different from those under which he worked. At high temps. radiation from  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  and apparently all other triatomic or higher atomic gases frequently assumes much significance.

W. A. MUELLER

**Kindling temperature of hydrogen detonating gas.** H. v. WARTENBERG AND H. KANNENBERG. *Z. physik. Chem.* 105, 205–10(1923).—The catalytic action of the walls of the vessel has been completely avoided by heating the gases separately and then mixing. The kindling temp. has been found to be 612° at 1 atm. pressure, a value which is 52° higher than that obtained by Dixon. For  $\text{CS}_2$  vapor the same kindling temp. (236°) as found by Dixon has been obtained.

H. JERMAIN CREIGHTON

**Free energy of the thiosulfate ion.** F. R. BICHOWSKY. *J. Am. Chem. Soc.* 45, 2225–35(1923).—The reaction  $\text{S} + \text{CaSO}_3 \cdot 2\text{H}_2\text{O} \rightleftharpoons \text{CaS}_2\text{O}_3 \text{ aq.} + 2\text{H}_2\text{O}$  was found to be reversible, and the equil. const. for several temps. was detd. The heat of the reaction and the sp. heat, f. p. and heat of diln. of solns. of  $\text{CaS}_2\text{O}_3$  were measured; also the solv. of  $\text{CaSO}_3 \cdot 2\text{H}_2\text{O}$  and its sp. heat. From these and other data the free energy of formation at 25° of the thiosulfate ion was calcd. to be  $-125,110 \text{ cal.}$

E. N. BENTING

**The heat theorem of Nernst mathematically and graphically represented.** C. C. DAVIS

**Chemical constant of hydrogen.** FRANZ SIMON. *Z. Physik* 15, 307–11(1923).—The value of the chem. const. of H has been recalled, with the aid of new thermal data.  $C_0 = -1.56 \pm 0.03$ . This value is in good agreement with the theoretical values. The pressures of the vapor in equil. with the solid have been calcd. by means of the Clausius-Clapeyron equation and the above const. for a range of temp.

C. R. PARK

**The entropy of diatomic gases and rotational specific heat.** R. C. TOLMAN AND R. M. BADGER. *J. Am. Chem. Soc.* 45, 2277–85(1923).—A direct mathematical method has been developed for detg. the theor. values of the constants  $S_2$  and  $C_{298,1}$  in these equations for the entropy of diatomic gases:  $S = 7/2R\ln T - R\ln p + 3/2R\ln M + R\ln J + S_2, S_{(298,1^\circ, 1 \text{ atm.})} = 3/2R\ln M + R\ln J C_{298,1}$ , where  $M$  is mol. wt. in g. per mol.,  $J$  moment of inertia in g. cm. squared per mol. A rigid dumb-bell mol. is assumed. Six theories proposed for rotational sp. heat, all based on the first form of quantum theory, but based on different assumptions as to a-priori probabilities and as to the lowest possible azimuthal quantum number, have been compared with exptl. values. 3 of the theories agree, and give exact coincidence for  $\text{N}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$  with a max. deviation of 3.5 in 45.8 for  $\text{NO}$ , where the exptl. value is very doubtful. These theories therefore give the most acceptable values for the consts. which are:  $S_2$ , 61.92;  $C_{298,1}$ , 101.57.

W. P. WHITBY

**The behavior of cadmium amalgams in relation to the Weston normal element.** ALFRED SCHULZE. *Z. physik. Chem.* 105, 177–203(1923).—The phase diagram of Cd amalgams has been detd. for the concn. range 8–15% Cd by wt. The position of the liquid-curve was ascertained by thermochem. means and confirmed by analysis of the liquid phase. The solid-curve could not be detd. in this way since apparently too little heat is rendered latent. Neither could it be ascertained by elec. cond. nor, in contrast to the results obtained by Bijl (cf. *Z. physik. Chem.* 41, 611), could it be detd. by the dilatometric method. The electromotive behavior of the amalgams was therefore studied to detect the ramification points in the temp. interval 0–25°. The results are in good agreement with electromotive measurements of Bijl between 25° and 75°, but disagree with his dilatometric results. It has been found that the ramification point of the amalgam employed in the Weston normal element (12.5% Cd) lies below 0°, so that Cohen's opinion of the metastability of the normal element is erroneous. Expts. with amalgams prep'd. electrolytically lead to the same results. Deviations of e. m. f. such as observed by Smith in the case of cells with chilled amalgam, are due to the fact that the compn. of the chilled amalgam differs from that of a slowly cooled amalgam.

H. JERMAIN CREIGHTON

**Metastability of the "international Weston element" and its unserviceability as a normal element.** II. W. JAEGER AND H. v. STEINWEHR. *Z. physik. Chem.* 105, 204(1923).—Polemical against E. Cohen and A. L. Th. Moesveld (cf. *C. A.* 17, 2089).

H. JERMAIN CREIGHTON

**Precise method of measuring small electromotive forces and the change in the thermoelectric power of tin at the melting point.** T. R. HARRISON AND PAUL J. FOOT. *J. Optical Soc. Am.* 7, 389–98(1923).—There has been some question as to the thermo-

elec. relations of Sn immediately above and below its m. p. An app. of higher precision than any previously used has been described. By means of it an investigation has been made of the thermoelec. behavior of the Pt-10%Rh *vs.* Sn-thermocouple. A sharp directional change has been discovered in the slope of the e. m. f.-temp. curve at the m. p. of Sn, showing a definite discontinuity in the thermoelec. properties of this metal. When the thermocouple was cooled from above the m. p. of Sn the e. m. f. values followed the continuation of the liquid Sn *vs.* Pt-10%Rh curve into the region representing undercooled liquid. The results have been verified by the use of a photoautographic device. The photographs are reproduced in the paper. The results are definite and positive in character but in entire disagreement with certain conclusions based upon the electronic theory of conduction. C. R. PARK

**Effect of tension on change of resistance and thermoelectromotive force by transverse magnetization.** ALPHUS W. SMITH. *Phys. Rev.* 22, 58-65(1923).—Ni wires 10 cm. long and 0.14 cm. in diam. were stretched while being magnetized transversely with a field of from 1000 to 9000 gauss. The application of tension was found to cause a marked decrease in the change due to the transverse magnetic field, both  $\Delta R/R$  (resistance) and  $\Delta E/E \Delta t$  (thermo-e. m. f.) being decreased to half or less by a stress of 20 kg./mm.<sup>2</sup>. The effect on the Hall and Nernst effects in a Ni plate of tension in the direction of the elec. and thermal currents for a tension of 28.5 kg./mm.<sup>2</sup> and for fields up to 20,000 gauss is zero. These results suggest that the Hall and Nernst effects are associated with the action of the magnetic field not on the atoms but on the free electrons, while the change of resistance and of the thermo-e. m. f. in a magnetic field are associated with a deformation of the atoms by the field. Ewing's model of the ferromagnetic atom, in which elliptic electronic orbits supply the magnetic control and a circular orbit the necessary Weber elements, accounts for changes of length, resistance and thermo-e. m. f. on magnetization and the effect of tension on these changes, assuming the Ni atom is compressed in the direction of magnetization and expands at right angles. G. L. CLARK

**The polarization of electrodes.** J. E. VERSCHAFFELT. *Rec. trav. chim.* 42, 332-6 (1923).—This is the continuation of a previous paper (*C. A.* 17, 2223) and is a mathematical discussion of the problem. E. J. WITZEMANN

**The form of the current tension lines in electrolysis.** A. H. W. ATEN. *Rec. trav. chim.* 42, 337-54(1923).—A mathematical theoretical discussion of the conditions and results on the form of current-tension lines encountered in galvanostegy, in galvanoplasty, in the refining of metals, etc. E. J. WITZEMANN

**Experiments on the sign of the electric charge assumed by a metal immersed in a liquid.** R. D. KLEEMAN AND WM. FREDRICKSON. *Phys. Rev.* 22, 134-6(1923).—See *C. A.* 17, 2075. E. J. C.

**The displacements of the capillary electrometer for progressive dilutions of the electrolyte.** CARL BARUS. *Proc. Nat. Acad. Sci.* 9, 156-8(1923).—After distd. H<sub>2</sub>O contg. a drop of H<sub>2</sub>SO<sub>4</sub> is replaced by pure H<sub>2</sub>O, the negative meniscus shows a much more rapid displacement than the positive. Graphs for the latter show a double inflection. After a 4th rinsing the phenomenon is very greatly retarded. The kinetic pressure of the negative ions in the metal are in excess of the pressure of positive ions. G. L. CLARK

**Measurement of the indices of refraction of a solid by immersion in a liquid heated to a determined temperature.** P. GAEBERT. *Bull. soc. franç. mineral.* 45, 89-94 (1922).—The Becke or Schröder van der Kolk method for the petrographical microscope is used. The solid whose *n* is to be detd. is placed in a hot liquid of slightly lower *n*. As the liquid cools its *n* becomes greater and finally equals that of the solid. By noting the temp. at which this occurs an exact defn. of *n* may be made. There is a list of suitable media, with their *n* at room temp., and the value  $dn/dt$  from which *n* at any temp. up to the b. p. may be calcd. E. F. HOLDEN

**The molecular scattering of light in liquid mixtures.** J. C. KAMESVARA RAV. *Phys. Rev.* 22, 78-84(1923).—The intensity of light scattered transverse to the primary beam by various dust-free mixts. is found to be much higher than is predicted by Einstein's formula, which takes into consideration scattering due to concn. fluctuations alone, but to agree qualitatively with the stricter theory developed by C. V. Raman, which takes into consideration also the scattering due to d. fluctuations and the orientation scattering due to the anisotropy of the mols. The polarization of transversely scattered light has been detd. and found to agree with the Raman theory. G. L. CLARK

**The scattering of light by liquid and solid surfaces.** C. V. RAMAN. *Nature* 112, 281-2(1923); cf. *C. A.* 16, 529.—Scattering by reflecting surfaces is usually considered as due to impurities. Careful expts. show that freshly split cleavage faces of crystals show

practically no scattering. A pure Hg surface shows blue opalescence because of the mobility of dispersion electrons. Surface scattering by transparent liquids is due to the effect of mol. bombardment.

G. L. CLARK

**Structural colors in feathers.** W. D. BANCROFT. *Nature* **112**, 243(1923).—Lecture. A review of B.'s work on the subject.

BENJAMIN HARROW

**The transfer in quanta of radiation momentum to matter.** WM. DUANE. *Proc. Nat. Acad. Sci.* **9**, 158-65(1923).—In order to explain the reflection by a crystal of X-radiation characteristic of the atoms in the crystal itself, discovered by Clark and Duane (*C. A.* **17**, 2660), the theory is presented that the momentum of radiation is transferred to and from matter in quanta, and that the laws of the conservation of energy and of momentum apply. Bragg's law,  $n\lambda = 2d \sin \theta$  is derived entirely independently of interference considerations; the above reflection and the peculiar intensities  $K_\beta > K_\alpha > K_\sigma$ , are explained; the equation for the light diffraction grating is derived. The original paper should be consulted for the steps involved in the mathematical derivations.

G. L. CLARK

**New method of preventing and recognizing the forgery of writing.** DOMENICO GANASSINI. *Boll. chim. farm.* **61**, 289-94(1922).—The writing on any desired portion of a manuscript may be transferred to a celluloid film without injury to the original document, and the film subjected to chem. tests to det. whether alterations have been made with a different ink or whether recent additions have been made with the same ink. A frame with a rectangular opening to expose the portion of the writing to be examd. is pressed over the manuscript and the opening then covered with a 10% soln. of celluloid in MeAc or AmOAc. After drying 24 hrs., the film is carefully removed. With most inks a portion is thus transferred to the film. The distinctness of the reproduction is much greater with fresh ink, and in some cases only the recent alterations appear on the transfer. The film may be examd. microscopically by transmitted light, or treated with chem. reagents which might ruin the original document. Where erasures have been made, some of the fibers of the paper adhere to the film.

A. W. DOX

The location of the forces which determine the electrical double layer between colloid particles and water (LOEB) **11A**.

### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**Ancient and modern alchemy.** PAUL D. FOOTE. *Chem. Age* (N. Y.) **31**, 337-41, 423-4(1923).—A description of at. structure and of the enterprise of modern alchemists in the transmutation of metals as contrasted with the efforts of the ancient alchemists.

F. O. A.

**Disintegration in discharge tubes.** H. P. WARAN. *Phil. Mag.* **46**, 305-12(1923).—The mech. disintegration of the glass walls of discharge tubes is described and is ascribed to local melting along the paths of the particles impinging on the glass which later results in minute cracks.

S. C. L.

**The Rutherford-Bohr atom-model and electrolysis.** R. RUDY. *Rev. gen. sci.* **34**, 362-5(1923).—A suggestive essay in which the relatively high mobility of heavy ions is attributed to the smaller binding forces and hence greater deformability of their electron shells. This makes their collisions with each other and with solvent molecules less elastic, less violent, and less numerous, hence the resistance to migration is less. The work of further ionization of ions is unknown but may well be nearly the same as that of the rare gas atoms isosteric with them (in Langmuir's sense). The indices of refraction support this view. As in MacMillan's hypothesis of stellar evolution it may be that certain electronic configurations may be stable in soln. only when the internal pressure is below certain limits. The dissociating power of electrolytes might thus directly depend on their internal pressures.

NORRIS F. HALL

**Origins of the conception of isotopes.** FREDERICK SODDY. *Proc. Roy. Inst. Gt. Brit.* May 4, 1923, 13 pp.; *Sci. Monthly* **17**, 305-17(1923).—An interesting historical lecture. Amplification of *C. A.* **17**, 2990.

NORRIS F. HALL

**Atmospheric electricity. The penetrating radiation of the earth and atmosphere around Innsbruck.** V. OBERGUGGENBERGER. *Sitzs. Akad. Wiss. Wien, Abt. IIa* **132**, 59-68(1923).—A given rock formation has a const. radioactive content which is dependent of the age of the formation. Sedimentary rocks have less than igneous rocks.

F. O. A.

**Spectrophotometric study of coloration phenomena by Becquerel rays.** MARIA BELAR. *Sitz. Akad. Wiss. Wien, Abt. IIa* 132, 45-54 (1923).—The coloration of glasses, kunzite, fluor spar and rock salt by  $\beta$ - $\gamma$ -rays and then their behavior in the dark, during illumination and during heating was followed quant. by spectrophotometric measurements of absorption coeffs. The satn. value depends on the intensity of the radiation in each case. Glass contg. Mn turns violet on exposure to  $\beta$ - $\gamma$ -rays, after which ultraviolet light does not affect the color although heating reduces the absorption. Glass without Mn is turned brown and the absorption is diminished by both heat and illumination. Lilac-colored kunzite first turns colorless and then green while the process reverses on heating.

F. O. ANDREKG

**An anomaly in the decay of radon in the presence of its active deposit.** FRANCOIS BEHOUNEK. *J. phys. radium* 4, 77-88 (1923).—B. has studied further the anomaly first observed by Curie. If  $\log I$  is plotted against time, the decrease in current becomes more and more rapid with a point of inflection between 18 and 21 hours when the central electrode is charged negatively. In this case the curve obtained lies above the straight line demanded by theory. When the electrode is charged positively, the same type of curve is obtained but below the theoretical line. When  $I_d/I_s$  is plotted against time (where  $I_d$  is the current due to the deposit present on the electrodes and  $I_s$  that due to the emanation and the active deposit present in the gas) the same type of curve is obtained with approx. the same inflection. Thus, the anomaly is due to the distribution of the active deposit and the amt. of active deposit present in the gaseous form must change with the time.

MARIE FARNSWORTH

**Radium.** R. B. MOORE. *Mineral Ind.* 31, 617-20 (1922).—A discussion of sources and production, with notes on mesothorium.

A. BUTTS

**Stopping power of lithium for  $\alpha$ -rays.** C. JACOBSEN AND JOHNS OLSEN. *Kgl. Danske Videnskab. Selskab. Math. fys. Medd.* 4, No. 2, 17 pp. (1922).—The stopping power of Li for  $\alpha$ -rays was detd. by measuring the change in range due to interposition of a thin sheet of metallic Li pressed between two mica sheets. The ratio between the stopping power of Li at. and H at. was found to be 2.46, a value in good agreement with Bohr's theory.

D. C. BARDWELL

**The present position of the radiation problem.** J. H. JEANS. *Proc. Phys. Soc. London* 35, 222-4 (1923).—A lecture.

E. J. C.

**Radioactive halos in fluor spar, spinel, granite and aenigmatite.** O. MÜGGE. *Nach. Ges. Wiss. Göttingen Math. physik. Klasse* 1923, No. 1, 1-18.—The blue to violet radioactive halos found in fluor spar from Wolsendorf, as exhibited under the microscope, are described in detail with respect to color, ring structure (ranges of  $\alpha$  particles), index of refraction, double refraction, polarization of light, resistance to heat, etc. Halos were observed also in certain specimens of spinel, granite, and aenigmatite.

D. C. BARDWELL

**Radioactive decomposition products in the atmosphere and the probability of their origin in the sun. III.** HERMANN BONGARDS. *Physik. Z.* 24, 295-6 (1923); cf. *C. A.* 17, 1583.—Measurements of the activity of air at high altitudes conducted in the Phillipine Islands by J. R. Wright and O. F. Smith over the same months as those by the author in Lindenburg, show max. and min. on the same dates. These results are considered by the author as strong evidence in favor of his theory.

D. C. B.

**The preparation of radium C.** HANS PETTERSSON. *Sitz. Akad. Wiss. Wien, Abt. IIa* 132, 55-7 (1923).—Rn enters a quartz tube 13 mm. in diameter and 100 in length through a side arm. Into the lower end of this tube one of invar steel is ground and its top covered by a loosely screwed-on disk. On immersing the steel in liquid air the Rn condenses on the disk. An Al disk  $1\mu$  thick is supported above this for some hours, rinsed with alcohol and heated to expel Rn. In one expt. from Ra equiv. to 200 millicuries of Ra C 81 millicuries RaC was concd. on the upper disk.

F. O. ANDREKG

**The sub-continental temperatures.** H. H. POOLE. *Phil. Mag.* 46, 406-17 (1923).—This paper largely written before the appearance of two recent ones by Joly (*C. A.* 17, 3131) is a theoretical and mathematical attempt to reconcile the temp. gradient of the earth's crust with its radioactive content. It has been supposed that the known gradient is too low for the known Ra content of the crust unless this high content is limited to the upper portion only. P. shows that the actual gradient  $3 \times 10^{-4}$  deg. per. cm. is only one half of the theoretical, without allowing for heat dissipated by underground waters coming to the surface, by volcanic eruptions, by secular variations in climate. The variations of heat cond. with temp. of the rocks must also be taken into account. It is concluded that the discrepancy is perhaps not a real one and that the radioactive content may be uniform down to the m. p. of the magma. It is suggested that owing to

tidal stresses and consequent coastal motions the continents toward the end of revolutionary periods become "stranded" on solidified magma, and that the heat evolved in lower regions is largely used in re-melting this magma. S. C. LIND

**Gamma rays from uranium X and their coordination to uranium X<sub>1</sub> and uranium X<sub>2</sub>.** OTTO HAEN AND LISSE MEITNER. *Z. Physik* 17, 157-67 (1923).—Gamma-ray absorption curves in Pb of U X<sub>1</sub> + U X<sub>2</sub> disclosed the existence of 4 groups. The 2 least penetrating belong to U X<sub>1</sub> and are not kernel  $\gamma$ -rays, but are characteristic X-rays from the L and K levels. The other 2 belong to U X<sub>2</sub> and are true kernel  $\gamma$ -rays. That U X<sub>1</sub> emits no kernel  $\gamma$ -rays was predicted by M. in a recent report (C. A. 17, 3449) from  $\beta$ -ray analysis. D. C. BARDWELL

**Secondary electron emission in hot-cathode tubes.** A. GÖRTZ. *Physik Z.* 24, 35-48, 53-63 (1923).—Hysteresis in the resistance of the hot cathode was used for observing the vacuum. The existence of a space charge at the source of the secondary electrons was proved. The number of secondary electrons (with satn. current) was found to be proportional to the number of primary electrons of const. final velocity. The secondary space charge can be overcome by introducing a second anode as fourth electrode. The characteristics of the secondary ray emission were shown to be linear. This means that the tube may be applicable for technical uses and directions are given for such uses. F. O. ANDERREGG

**Hafnium or celtium.** BOHUSLAV BRAUNER. *Chemistry and Industry* 42, 884-5 (1923).—Polemics in favor of the name celtium and of Urbain and Davyliére as discoverers. NORRIS F. HALL

**Discovery of hafnium and the present state of our knowledge of this element.** GEORG VON HEVESY. *Ber. 50B*, 1503-16 (1923).—An authoritative summary and an extension of C. A. 17, 2524. NORRIS F. HALL

**Chemistry of hafnium.** GEORG VON HEVESY. *Chem. News* 127, 33-4 (1923).—Hf is much more closely related to Zr than to Th. The best sepn. based on solv. is by cryst. of the K double fluorides. The Hf accumulates in the mother liquor. Exptl. data are given. Many other methods of sepn. are mentioned. Preliminary at. wt. data give Hf = 178.4-180.2. NORRIS F. HALL

Should the element of atomic number 72 be called celtium or hafnium. G. URBAIN. *Chemistry and Industry* 42, 764-9 (1923).—A thorough review of the history of the case and a logical presentation of U's claim to priority. A complete bibliography is included. Also in *Chemistry & Industry* 42, 929-30. NORRIS F. HALL

**Cesium doublets.** F. J. V. WISNIEWSKI. *Physik Z.* 24, 291-5 (1923).—Empirical formulas are proposed for the doublet frequency differences of the *p* and *d* terms of Cs. NORRIS F. HALL

**Light scattering; bibliography.** W. H. MARTIN. *Trans. Roy. Soc. Canada* 16, 276-81 (1923). E. J. C.

**The absorption of light by sodium vapor.** F. H. NEWMAN. *Phil. Mag.* 46, 420-5 (1923).—The radiation from a Na-K alloy vapor or lamp of quartz was passed through a lens and Nicol prism, then through a second heated quartz lamp contg. feebly luminous Na vapor, and again through a Nicol prism and lens. White light from an elec. arc passed through this feebly luminous Na vapor showed absorption of  $\lambda$ 6161,  $\lambda$ 6154,  $\lambda$ 5688,  $\lambda$ 5683 lines belonging to the subordinate series. These effects are explained by the presence of atoms in an abnormal state, this state being brought about by an elec. stimulus. The valency electron of these atoms is in the first *p* ring. C. C. A. 17, 3137. S. C. L.

**Grouping of the lines of the secondary spectrum of hydrogen.** K. BASU. *Phil. Mag.* 46, 417-20 (1923).—Admitting that the secondary lines are due to the H<sub>2</sub> mol., B. discusses the difficulties of dealing with the secondary lines theoretically. The possibility of explaining some of these lines as due to H<sub>2</sub><sup>+</sup> is treated by assuming that the distance between the nuclei is  $1 \times 10^{-8}$  cm., and that the remaining electron revolves about them. From Bohr's rule, the lines thus calcd. show some agreements with known lines, but the coincidences may be fortuitous, and B. suggests that until this simplest problem in mol. structure has been solved, it is premature to proceed to more complicated ones. S. C. L.

**Transfer in quanta of radiation momentum to matter (DUANE) 2. Deposition of calcites toward Ra radiations (HEADDEN) 8. Radioactive plastic masses (Brit. pat. 196,518) 17. Radioactive vacuum tube (U. S. pat. 1,460,777) 17.**

## 4—ELECTROCHEMISTRY

COLIN G. FINK

**Storage battery.** T. R. COOK. U. S. 1,467,707, Sept. 11. Structural features.

**Storage battery.** V. C. STANLEY. U. S. 1,466,674, Sept. 4. Structural features.

**Storage battery.** H. C. THOMPSON, JR. U. S. 1,468,051, Sept. 18. Structural

features.

**Storage-battery plates.** R. C. BENNER. U. S. 1,467,749, Sept. 11. An alkali metal bisulfate, e. g.,  $\text{NaHSO}_4$  or  $\text{KHSO}_4$ , and rubber, celluloid or other non conductive binding material are mixed with active material contg. a predominating proportion of  $\text{PbO}_2$  together with a small amt. of  $\text{PbSO}_4$ ,  $\text{PbCO}_3$  or other Pb compd. and after this mixt. is applied to a conductive support sol. materials are removed from it by leaching to leave a somewhat porous product.

**Storage battery electrodes.** H. G. WAGNER. Brit. 196,127, Feb. 6, 1922. Porous active material for storage battery electrodes is made by soaking sawdust in a soln. of  $(\text{NH}_4)_2\text{SO}_4$ , draining off the excess of soln. and mixing the damp sawdust with  $\text{PbO}_2$  or powd. Pb, then with C and finally with calcined  $\text{CaSO}_4$ . The mixt. is then molded into shape, the  $\text{NH}_4$  and Ca sulfates causing the mass to set and harden. The molded material is then dried in a room at  $250^\circ\text{F}$ . and then placed in  $\text{H}_2\text{SO}_4$  until all the wood is destroyed. Cf. 196,126.

**Device for replenishing storage batteries with water.** H. WATZMAN. U. S. 1,467,966, Sept. 11.

**Preparing storage batteries for shipment or storage.** C. C. CARPENTER. U. S. 1,468,259, Sept. 18. A storage battery is brought approx. to a state of full charge and the electrolyte is then washed from the battery and it is sealed to exclude air.

**"Rejuvenating" storage batteries.** R. E. CARTER. U. S. 1,468,341, Sept. 18. A mixt. of  $\text{PbO}$  47,  $\text{MgO}$  16, "French zinc" 30, gypsum 15, Epsom salt 14, graphite 16,  $\text{NaCl}$  3 and  $\text{CuSO}_4$  3 g. is used for facilitating recharging and exciting old batteries, together with  $\text{HOAc}$  soln. and a small amt. of oil.

**Primary electric battery.** F. R. PARKER. U. S. 1,468,574, Sept. 18. Structural features.

**Dry-cell electric battery.** W. S. DOE. U. S. 1,467,240, Sept. 4. Structural features.

**Tubes for holding dry cell electric batteries.** A. I. FOLSON. U. S. 1,467,577, Sept. 11. Structural features.

**Electric battery terminal.** J. F. PRAX. U. S. 1,467,651, Sept. 11. Structural features.

**Coating battery electrodes.** H. D. LAPKIN. U. S. 1,467,047, Sept. 4. Battery cups which may be formed of Zn are treated with cooked paste which is caused to solidify upon the lower portion of the cup to form a coating. Excess coating material is removed without permitting it to wet the cup except at the portion which is to be coated.

**Depolarizing electrodes for batteries.** G. W. HEGSE. U. S. 1,468,234, Sept. 18. A layer of "NH<sub>3</sub>-contg." "high voltage oxide" such as Cu oxide 100, S 1.2 and  $(\text{NH}_4)_2\text{SO}_4$  2.5 parts is formed upon the interior surface of a perforated tinned-Fe container and the space within the container is filled with depolarizing material contg. Cu oxide.

**Anode for electrolytic apparatus.** A. P. MUNNING. U. S. 1,467,060, Sept. 4. Anodes adapted for use in electrolytic app. are formed with oblique ridges on their surface (in the form of a spiral screw thread).

**Anodes for the manufacture of per-compounds.** CHEMISCHE FABRIK WEISSENSTEIN GES. AND G. BAUM. Brit. 198,246, July 7, 1922. The anodes consist of Ta partially covered with Pt or of an alloy of Ta with Pt. The coating when used may be effected by electrolysis or by hammering, welding, rolling or the like.

**Electrodeposition of articles.** S. O. COWPER-COLES. Brit. 195,997, Oct. 12, 1921. In a process for producing metal sheets, wires, tubes, cylinders or other articles, the cathode is given a reciprocatory motion of sufficient rapidity to throw off the denuded film of electrolyte in contact with it. At the required frequency gas bubbles cease to appear on the cathode. In depositing Pb 100-25 reciprocations per min. may be made, enabling a current d. of 100 amp. per sq. ft. to be used. A suitable app. is specified.

**Electrodeposition of metals.** T. W. S. HURCHINS. Brit. 197,066, Feb. 15, 1922. In the electrodeposition of metals such as Fe, Ni and Co means is provided to ensure that the electrolyte around the cathode is completely freed from all solid particles such as graphite which would form a couple with the metal being deposited. A suitable app. is specified.

**Apparatus for electrodeposition of metals.** A. CREMER. U. S. 1,466,994, Sept. 4, 1923.

**Electrodeposition of nickel.** N. V. HYBINETTE. Brit. 193,881, Aug. 29, 1921. In a process for depositing Ni in which there is a flow of electrolyte from the cathode chamber to the anode chamber through a filtering diaphragm, electrolyte contg. free  $H_2SO_4$  is supplied to the cathode chamber, the current density, rate of flow and the nature of the diaphragm being such that the electrolyte is rendered nearly neutral in the neighborhood of the cathode. In an example the electrolyte of  $NiSO_4$  contg. 50 g. of Ni and 2 g. of free  $H_2SO_4$  per l. is supplied at a temp. of 50°; the excess pressure in the cathode chamber is  $\frac{1}{2}$  in. to 1 in., producing a flow of about 1 l. per sq. ft. per hr. With a current density of 10 amp. per sq. ft., the acidity of the electrolyte near the cathode is reduced to about 0.2 g. per l. A suitable construction is specified.

**Electrolysis of fused salts.** E. A. ASHCROFT. Brit. 198,024, Feb. 18, 1922. The electrolysis of fused metallic salts, such as fused chloride of Zn or Pb, or a mixt. thereof is effected in an electrolyzer provided with a series of closely spaced electrodes which constitute a series of elec. couples immersed in the same electrolyte, only the first and last of the electrodes of the series being connected to the external circuit. A suitable construction is specified.

**Electrodeposition of cobalt and chromium.** H. C. PEPPER and H. C. PIERCE. U. S. 1,465,173, Aug. 14. Co-Cr alloy resistant to atm. conditions and to acids is deposited from a soln. of salt such as Co and Cr sulfates or chlorides while controlling the temp. and current density to form a hard coherent deposit. A cast Cr anode and sheet steel cathode may be used.

**Electrodeposition of dense ductile copper.** F. L. ANTISELL. U. S. 1,465,034, Aug. 14. An elec. current is passed between a cathode and a plurality of anodes in a Cu-bearing soln. while employing at least one anode which is insol. in the electrolyte and not attacked by the products of electrolysis. This anode may be formed of Pb while the other anodes are formed of cupriferous material attackable by the electrolyte.

**Electrodeposition of tin.** COINX G. FINX. U. S. 1,466,126, Aug. 28. Sn is deposited from a soln. formed of  $Na_2SO_4$ , Sn,  $H_2SO_4$ , algin and  $H_2O$  or other soln. contg. a preponderance of  $SO_4$  ions over other anions and a preponderance of Na, Mg, Fe, Al (or other metal ions electropositive to Sn) over other cations. A soln. of this character is adapted for electrolytic refining of crude tin metal or of compressed, reduced impure Sn ores.

**Electrolytic iron.** F. A. EUSTIS. Brit. 196,334, Dec. 22, 1921. In the electrolytic extrn. of Fe from ore or other materials, a ferric soln., or a ferric and ferrous soln., is reduced either before or during leaching of the ore, etc. The Fe salts in soln. may be chlorides, sulfates, etc. A suitable construction is specified. Cf. C. A. 17, 3160.

**Treating gases, etc., electrically.** L. HEIS and H. BEZLER. Brit. 194,293, Feb. 28, 1923. Substances in the form of gases, vapors, or suspended particles are forced through elec. fields having an intensity of at least  $10^5$  v. per cm.; a field of  $10^4$  v. per cm. is suitable for treating N. Ionization by collision is checked by highly compressing the gas, say, to 100 atm. The chem. affinities of the substances are overcome, and reactions ensue which may be favored by heat. Substances which lower the cond. of the gas without affecting the chem. reaction may be added. Ionization may be further diminished by the expansion of vaporized substances in the elec. field. Different substances may flow separately through elec. fields and then be mixed to produce reactions. The process is applicable to the production of N oxides from air. A suitable construction is specified.

**Treating iron and zinc sulfide ores.** F. A. EUSTIS and D. BELCHER. U. S. 1,466,793, Sept. 4. A soln. obtained from Fe and Zn ore is electrolyzed to obtain a cathode deposit of mixed Fe and Zn and the latter is volatilized by heating to leave a deposit of pure Fe.

**Extracting vanadium.** VANADIUM CORPORATION OF AMERICA. Brit. 195,688, Nov. 30, 1921. V contg. materials are reduced by smelting with a carbonaceous reducing agent. Ferro-V may be formed from a charge of V ore or other V bearing material. The Fe is preferably in the form of Fe scale or ore; fluxes such as glass cullet, lime and fluorspar, and coke; or, when the charge contains no Fe, V may be obtained. The process may be carried out in an elec. furnace comprising a casing having a C lining, refractory cover and 3 water-cooled electrodes for use with 3 phase current, the voltage being not less than 150 and the current density being not less than 35 amp. per sq. in. of electrode cross-section. The charge is fed through shoots into the high-temp. zone between the electrodes, and the product is tapped from time to time through an outlet. Cf. 3073, 1895, 784, 1903, 22,422, 1904 and 104,064.

**Separating platinum from gold and palladium.** E. SLATINEANU. U. S. 1,467,202,

Sept. 4. H previously treated with ultra-violet rays is introduced into a soln. contg. Au, Pd and Pt to ppt. the Au and Pd and the Pt is then recovered by electrolysis.

**Electrolytic cell adapted for decomposing water.** J. M. ALLEN. U. S. 1,467,080, Sept. 4.

**Electrolytic cell adapted for producing chlorine and caustic soda from salt solutions.** J. M. WILLIAMS. U. S. 1,467,217, Sept. 4.

**Electric arc furnace operation.** J. A. SIEDE. U. S. 1,466,603, Aug. 28. A furnace adapted for working Fe or steel charges is operated upon an a. c., first with a short arc, then with an arc of increased length while maintaining the current value and finally with an arc of reduced length employing a lower energy input.

**Electric arc furnace adapted for melting metals.** E. F. KIEFER. U. S. 1,467,044, Sept. 4.

**Electric furnace for heat treatment of metals.** L. C. JOSEPHS, Jr. and G. WIRRER. U. S. 1,467,669, Sept. 11.

**Furnace for heat treatment of metal articles.** L. C. JOSEPHS, Jr. and G. WIRRER. U. S. 1,467,670, Sept. 11. A change in the conditions of heat treatment, e. g., movement from one heating zone to another, is automatically controlled by change of dimensions of the articles under treatment.

**Protector for electrodes of electric furnaces.** W. DYRSSEN. U. S. 1,468,103, Sept. 18. A sleeve surrounding the joint of a sectional electrode prevents the electrode from being reduced in diam. by burning away in the zone of the joint.

**Electric arc welding furnace.** I. D. SHIPPER. U. S. 1,467,954, Sept. 11.

**Device for handling carbon electrodes of electric furnaces.** A. W. GREGG. U. S. 1,466,503, Aug. 28.

**Electroplating.** A. CLASSEN. Brit. 197,885, Sept. 26, 1922. Addn. to 186,459. Colloids having the property of preventing the generation of H at the cathode are added to a bath for depositing glossy metallic coatings, e. g., a coating of Zn on Fe. A suitable addn. may be prepd. by covering a jelly contg. gelatin with  $H_2O_2$  until it liquefies. Other colloids such as gum, albumin, starch, or dextrin may be used instead of gelatin. Persulfates, perborates, percarbonates, persilicates, perphosphates, pyroperphosphates, persulfuric acid or permanganous acid may be used instead of  $H_2O_2$  and are preferably acted upon, e. g., by  $H_2SO_4$ , so as to yield  $H_2O_2$ .

**Electroplating.** G. P. TUSSAUD. Brit. 196,510, June 7, 1922. Articles from which metal replicas are to be made by electrolysis are dipped in liquid made by mixing 1 lb. of P dissolved in 15 lb. CS<sub>2</sub>, 1 lb. carnauba or other wax dissolved in 1 lb. turpentine, 2 oz. rubber dissolved in a little CS<sub>2</sub>, and 1 lb. of asphalt dissolved in just enough CS<sub>2</sub> to be liquid. The P soln. may be replaced by 1 lb. of metol dissolved in 10-20 lb. of toluene. The articles, after drying, are then dipped in a soln. of 1/3 oz. of Ag nitrate in 1 gal. of H<sub>2</sub>O or alc. After drying they are then coated electrolytically with Cu, Ag, Au, bronze or other metal. When the articles are of a delicate nature, such as flowers, leaves, lace or the like, they are stiffened before subjection to the above treatment by dipping in a French polish consisting of about 2 oz. of shellac dissolved in a pt. of methylated spirit and drying. After plating, the articles are heated to redness, thereby volatilizing the P, if present, and quenched in water or oil; oil renders Cu articles tougher but less pliable.

**Anode for electroplating.** B. BART. U. S. 1,467,083, Sept. 4. Active metal of the anode, e. g., Cu, is held by a securing and reinforcing bar of Ni, Ni alloy or other inert metal which serves to hold the active metal together in the event of dissolution and disintegration of portions of the same.

**Tray for electrochemical cleansing of silver.** P. A. FARALLA. U. S. 1,467,574, Sept. 11. Structural features.

**Electric resistances.** S. KATATANI. Brit. 197,340, May 7, 1923. An elec. resistance material which does not fuse nor oxidize at high temps., applicable, e. g., to elec. heaters and furnaces and to lightning arresters, comprises a mixt. of one or several powdered ferro alloys, such as ferro-Si, ferro-W, ferro-Mo, ferro-Ti or ferro-Cr, with a powd. material which does not easily fuse, such as fireclay, magnesite or other material contg. a large proportion of MgCO<sub>3</sub>, the mixt. being kneaded and heated to 1500-1600°. A mixt. of ferro-Si and fireclay powders contg. 20 to 30% of fireclay may be kneaded with water, pressed into a mold, allowed to dry and harden, and heated in a fireproof air-tight container. Terminal layers of C powder kneaded with coal tar or pitch may be placed at each end of the resistance in the mold.

**Electric resistance material.** F. L. DRIVER, JR. U. S. 1,465,547, Aug. 21. Drawn metallic resistance elements for high-temp. heating are formed of a carbide-contg. alloy comprising Ni and Cr. The C content is at least 0.2% and the carbide is substantially

uniformly distributed throughout the material by a C-distributing constituent such as Si and silicides, equiv. to 1-2% Si.

**Iron alloy for electrical resistance heating.** P. A. E. ARMSTRONG. U. S. 1,407,562, Sept. 11. An alloy steel is formed of Cr 3-30, Si 0.5-5, Al 0.4-4 and C 0.05-1.5%, the remainder of the alloy being principally Fe.

**High-temperature resistor material.** N. B. PILLING and R. E. BEDWORTH. U. S. 1,467,810, Sept. 11. Resistors for furnaces, etc., are formed of an oxide having a low negative temp. coeff. of resistivity, e. g., Cd oxide and 5% Zr silicate.

**Tungsten alloy with silicon.** A. Pacz. U. S. 1,468,073, Sept. 18. Drawn filaments for incandescent elec. lamps are formed of W contg. about 1-3% of Si. The filaments are of good "non-sagging" properties.

**Requirements of refractories for electric furnaces (WILLIAMS).** 19. Metallized rubber (Brit. pat. 196,063) 30.

## 5—PHOTOGRAPHY

C. E. K. MEERS

**Paper with high sensitivity for green light for photographic photometry.** J. M. EDER. *Anz. Akad. Wiss. Wien.* 1922, No. 22-3, 197-8.—Either AgCl or AgBr paper can be sensitized to green and yellow light by soaking in a 1% soln. of the yellow dye Pinaciflavol. This has advantages for photometric work over the red dyes, erythrosin and rhodamine, ordinarily used. The dye treatment lasts 3 min. and is followed by bathing in 5% NaNO<sub>2</sub> and glycerol. The emulsion can also be mixed with the dye before putting on the paper. This paper permits photometric measurements on certain wave lengths which hitherto have presented many difficulties. A. E. STEARN

**Influence of development and the action of intensifying screens upon photographic plates exposed to X-rays.** E. SCHLECHTER. *Physik. Z.* 24, 29-35 (1923).—The plates were exposed to the characteristic radiation excited in a radiator by a primary beam of X-rays. The three developers used, metol-hydroquinone, adriol, and glycine, gave similar density-exposure curves, the metol-hydroquinone giving slightly the highest contrast. The rate of development with glycine was affected markedly by temp., while (contrary to the usual experience) temp. had but little effect upon metol-hydroquinone. The intensifying factor of intensifying screens diminished with increasing wave length, except for a sudden increase at 0.5 Å, and then a further gradual decrease with longer wave lengths. This effect was considered to be due to a decrease in fluorescing power with increasing wave length. The optimum wave-length range for diagnostic radiography was estd. to be 0.46-0.6 Å. The diminution of intensifying factor with lowered X-ray intensity was accounted for by the failure of the reciprocity law for exposures of the plate to ordinary light, while for X-ray exposure the reciprocity law was valid. C. E. K. MEERS

**Photographic transfers.** F. W. KENT. U. S. 1,466,532, Aug. 28. A mount is coated with gelatin and a hardening reagent or other liquid which when dry possesses a reflecting or shiny surface and a transfer print with a mat surface is laid upon the surface and allowed to adhere without application of pressure.

**Color motion-picture photography.** F. T. O'GRADY. U. S. 1,465,053-4, Aug. 14. The pats. relate to the use of color filters in making successive negative and positive prints.

## 6—INORGANIC CHEMISTRY

A. R. MIDDLETON

**Phototropic compounds.** M. L. DEY. *Nature* 112, 240 (1923).—In attempts to prepare (SHgI)<sub>2</sub>, D. obtained 2HgS.HgI, "which showed phototropy to a remarkable degree." BENJAMIN HARROW

**Complex ions formed by silver salts and ammonia or substituted ammonias.** P. JOB. *Compt. rend.* 176, 1805-8 (1923); cf. C. A. 17, 1930.—The formation of complex ions of Ag with Et<sub>3</sub>NH and (CH<sub>3</sub>)<sub>2</sub>N<sub>2</sub> was studied as in the preceding paper. In concd. soln. Et<sub>3</sub>NH forms [Ag|(C<sub>2</sub>H<sub>5</sub>)<sub>3</sub>NH]<sup>+</sup>, in dil. soln. [Ag|(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>NH]<sup>+</sup>. Similar complexes are given by (CH<sub>3</sub>)<sub>2</sub>N<sub>2</sub>. The equi. consts. and heats of formation of the complexes are calcd. T. S. CARSWELL

**Preparation of coarsely crystallized anhydrous titanium trichloride. Mechanism of the reaction in reduction of titanium tetrachloride by hydrogen.** F. MEYER, ALFRED BAUER AND RICHARD SCHMIDT. *Ber.* **56B**, 1908-14(1923); cf. Ruth and Neumann, *C. A.* **17**, 2842.—Attempts of many workers to improve the procedure of Ebelmann (*Ann.* **64**, 269) which gives very small yields have usually been based on the cold-hot tube principle of Deville. This gives so finely divided a product that experimentation with it is difficult or impossible. The authors have submitted the Ebelmann process to minute investigation particularly as to the mechanism of the reaction and found it much more complicated than the reaction usually assumed,  $2\text{TiCl}_4 + \text{H}_2 \rightleftharpoons 2\text{TiCl}_3 + 2\text{HCl}$ . At least 3 reactions are involved: (a)  $\text{TiCl}_4 + \text{H}_2 \rightleftharpoons \text{TiCl}_3 + 2\text{HCl}$ ; (b)  $\text{TiCl}_3 + \text{TiCl}_4 \rightleftharpoons 2\text{TiCl}_3 + \text{H}_2$ , b takes place below  $400^\circ$ ; above about  $600^\circ$ ; but its reverse reaction at much lower temp.; at  $600^\circ$  the forward reaction is slow, the reverse reaction rapid as soon as HCl has appreciable concn. Above  $300^\circ$  c sets strongly toward the right. The mass-action equations show that the destructive effect of HCl can be decreased by using an excess of either TiCl<sub>3</sub> or H<sub>2</sub>; with respect to b the former should be more effective. In practice the mol. proportions TiCl<sub>3</sub>:H<sub>2</sub> = 1:6 were found most serviceable. Not only the temp. fall beyond the reaction zone but also the area of surface upon which TiCl<sub>3</sub> can condense proved of great importance. Wide (40 mm.) tubes of Ni gave nearly 0 yield; quartz, same diam., 0.5%; smaller tubes 2%. Small tubes permit the interval 600-400° within which a tends strongly toward the left, to be passed over quickly but not sufficiently so to prevent formation of large crystals. Within the furnace, however, large tubes are preferable as giving greater reaction space and so promoting the primary reaction a. Combination of these principles together with a simple system of air cooling brought the yield to 5% of the TiCl<sub>4</sub> reacting and to 15%, considering that most of the TiCl<sub>3</sub> distg. out could be recovered. The TiCl<sub>3</sub> was in well formed violet crystals very stable and decomp. only after standing in air several hrs. Much higher yields were obtained by providing an absorbent for HCl; most effective proved com. Ti metal, which above  $300^\circ$  forms TiCl<sub>3</sub> only and no lower chlorides. With this at  $1000^\circ$  20-30 g. of TiCl<sub>3</sub> were obtained in 3-4 hrs. with a yield 30% of the TiCl<sub>4</sub> employed. The crude product contg. over 40% TiCl<sub>2</sub> could be transformed to pure TiCl<sub>3</sub> by heating with TiCl<sub>4</sub> at  $300^\circ$  in a current of H<sub>2</sub>. By wt. 1 pt. Ti to 12 parts TiCl<sub>3</sub> was employed. It was established that TiCl<sub>3</sub> can be sublimed without much loss in a 1:6 TiCl<sub>3</sub>-H<sub>2</sub> current at  $600^\circ$ . This makes possible recovering pure TiCl<sub>3</sub> from old, partially oxidized mixts. The app. used is fully described.

A. R. M.

**The formation of sulfides, selenides and tellurides of copper.** FELICE GARRELLI. *Atti accad. sci. Torino* **58**, 297; *Rec. trav. chim.* **42**, S18-20(1923).—This is a brief report on results obtained by the reaction observed by Wicke (*Ann.* **82**, 145(1852)), who found that a piece of S wrapped with Cu wire placed in a satd. CuSO<sub>4</sub> soln. became covered with CuS. This was fully confirmed. The Cu titer of the soln. is not changed. The CuS is formed from the Cu and S. One g. of Cu filings and 1 g. S powder were agitated in a Cu salt soln. and completely transformed into CuS in 12 hrs. at room temp. At boiling temp. the reaction is greatly accelerated, giving bluish black CuS. Using 2 atoms Cu for 1 atom S gave Cu<sub>2</sub>S as an amorphous black powder. The formation of CuS from Cu and S in distd. H<sub>2</sub>O is very slow. Brass turnings and S were heated with steam in a CuSO<sub>4</sub> soln. The Cu is rapidly converted into CuS while the Zn replaces the Cu in soln. Se behaves like S in these expts. Cu<sub>2</sub>Se was also obtained as was Cu<sub>2</sub>As as greenish black crystals. From a large excess of Cu and a little Se in CuSO<sub>4</sub> at  $40^\circ$  a product Cu<sub>2</sub>Se<sub>2</sub>, umangite, was obtained. At boiling temp. Cu<sub>2</sub>Se and Cu<sub>2</sub>Te were also obtained in the amorphous form. With Te similar expts. gave a product Cu<sub>4</sub>Te. Details are to be published. E. J. WITZEMANN

**Bismuth tetroxide prepared from sodium bismuthate.** C. E. CORFIELD AND ELSIE WOODWARD. *Pharm. J.* **111**, 80-2, 123; *Chemist & Druggist* **99**, 134(1923).—An old lecture sample dated 1879 and marked "Bismuth pentoxide, Bi<sub>2</sub>O<sub>5</sub>" proved to be mislabelled. Neither HBiO<sub>3</sub> nor Bi<sub>2</sub>O<sub>5</sub> will result from decompt. of NaBiO<sub>3</sub> with HNO<sub>3</sub>, as no substance with as high an available O content could be obtained. Instead, hydrated Bi<sub>2</sub>O<sub>5</sub> contg. between 1 and 2 mols. of H<sub>2</sub>O was formed. Attempts to reduce this to 1 mol. caused loss of O. Previous literature is quoted. S. WALDBORR

**Nickel sulfide.** FRITZ ÉPHRAIM. *Ber.* **56B**, 1885-6(1923).—Products analogous to the NH<sub>4</sub>CuS<sub>x</sub> of Blitz and Herns (*C. A.* **1**, 1364) were obtained by a similar procedure. 120 cc. of NH<sub>4</sub>OH, sp. gr. 0.90, was satd. with HS, one half digested at  $40^\circ$  with 30 g. S and united with the other half. To this soln. was added a soln. of 10 g. of NiSO<sub>4</sub> crysts. in 100 cc. water. Upon rotating with exclusion of air the black ppt. soon dissolved in great part. The rapidly filtered soln. was placed in a completely filled and tightly

closed flask and allowed to stand. A cryst. product sepd. after a few hrs. and continued to form for several days. It consisted of small black grains, extremely reactive to air and moisture, which visibly steamed when exposed on a porous plate in consequence of heat evolved. It reacted with EtOH when this was used for washing. Dried in vacuum it remained deep black. Washing with water caused decompn. Analysis of an unwashed sample pressed on a porous plate indicated a compn. between  $\text{NH}_4\text{NiS}_4$  and  $\text{NH}_4\text{NiS}_6$ . Alkali sulfides other than  $\text{NH}_4$  dissolve no  $\text{NiS}$ , which may indicate that an amino compd. rather than an  $\text{NH}_4$  salt is formed by  $(\text{NH}_4)_2\text{S}_x$ . Salts of Co, Fe, Zn, Mn and Cd gave no sign of similar reaction, an indication of the different nature of CuS and NiS from those of other similar metals, which is in agreement with the recent observations of Gluud and Mühlendyck (*C. A.* 16, 2087, 3278; 17, 2211). A. R. M.

**New series of iridium complex salts containing hydrazine.** L. CHUGAEV. *Ber.* 56B, 2067-8 (1923).—When  $\text{K}_2\text{IrCl}_6$  is warmed on a boiling water bath with excess of 10% soln. of  $\text{N}_2\text{H}_4\text{Cl}$  until evolution of gas ceases and the soln. takes on a rose brown color (about 10 min.), the soln. contains the acid of a basic complex,  $\text{H}[\text{Ir}(\text{N}_2\text{H}_4\text{Cl})_4]$ . With Reiset's Base I it forms an abundant ppt. of brilliant, flesh-colored, rather large leaves of compn.  $[(\text{Ir}(\text{N}_2\text{H}_4\text{Cl})_4)_2][\text{Pt}(\text{NH}_3)_4]$ . If excess of CsCl is added to the original soln., cryst.  $\text{Cs}[\text{Ir}(\text{N}_2\text{H}_4\text{Cl})_4]$  separates. Both compds. are little sol. in water, the latter considerably more sol. than the former. The former reacts with  $\text{K}\text{PtCl}_4$  in excess forming quantitatively the green salt of Magnus,  $[\text{Ir}(\text{N}_2\text{H}_4\text{Cl})_4\text{Pt}(\text{NH}_3)_4] + \text{K}_2\text{PtCl}_6 = [\text{Pt}(\text{NH}_3)_4]\text{PtCl}_6 + 2[\text{Ir}(\text{N}_2\text{H}_4\text{Cl})_4]\text{K}$ . The new acid is structurally analogous to the Pt-type acid described by Cossa. For tervalent Ir and monamine, A, the formula would be  $\text{H}_2[\text{IrACl}_5]$ ; the basicity of this acid would decrease by 1 for the  $\text{N}_2\text{H}_4$  derivative when formed in acid medium because change of  $\text{N}_2\text{H}_4$  to  $\text{N}_2\text{H}_5$  raises the positive valence and hence must lower the negative valence. Compare the earlier described  $[\text{Pt}(\text{NH}_3)_2(\text{N}_2\text{H}_4)_2\text{Cl}_2]$  and  $[\text{Pt}(\text{NH}_3)_2(\text{N}_2\text{H}_4)_2\text{Cl}_4]$ . A. R. M.

**The reduction of some halides by means of hydrogen.** N. PARRAVANO AND C. Mazzetti. *Rec. trav. chim.* 42, 821 (1923).—The reaction  $\text{MX}_2 + \text{H}_2 \rightleftharpoons \text{M} + 2\text{HX}$  leads to equil. If the halide is easily vaporized the reduction should be favored by any conditions that would remove the metal from the region of reaction. Expts. were made in which  $\text{BCl}_3$ ,  $\text{AlCl}_3$ ,  $\text{CCl}_4$ ,  $\text{SiCl}_4$ ,  $\text{TiCl}_4$ ,  $\text{WCl}_6$ ,  $\text{MoCl}_6$  and  $\text{VC}_4$  were passed over an iron rod at 900° in the form of vapor mixed with  $\text{H}_2$ . In all cases the outer layer of the Fe was converted into an Fe alloy of B, Al, C, Si, Sn, Ti, W, Mo and V, resp.

E. J. WITZEMANN

**The slow oxidation of phosphorus.** ELIZABETH GILCHRIST. *Proc. Roy. Soc. Edinburgh* 43, II, 197-215 (1923).—Oxidation of P may take place without visible glow. For the glow to be visible the action must occur at a certain min. rate. The glow is probably produced by the oxidation of  $\text{P}_2\text{O}_5$  and this action must take place at considerably slower rate than the formation of the  $\text{P}_2\text{O}_5$ , which precedes it. The glow occurs chiefly in the gas phase, and may be steady, fluctuating, or intermittent. The intermittence of fluctuation is explicable by the slow accumulation of oxidizable vapor and subsequent oxidation with glow, for which a certain pressure of oxidizable vapor derived from P is necessary. The rate of reaction is increased with rise of temp. At partial pressures of O near 1 atm. the rate is diminished with rise of O pressure, and may be slowed below the glowing point. The presence of ozone in O greatly increases the glow, but the glow itself is not under ordinary conditions due to ozone produced in the reaction. A trace of  $\text{H}_2\text{O}$  seems necessary to start the reaction, but as the  $\text{H}_2\text{O}$  vapor pressure increases, the rate reaches a max. and thereafter falls. The reaction as time goes on seems to be automatically slowed below the rate at which a glow is visible. This slowing may be overcome by raising the temp. or by reducing the O pressure, or by a gradual accumulation of the vapor. Certain gases act as positive catalysts, and others as poisons. The retarding effect which certain vapors have on the reaction is not due to their ozone-destroying properties, nor to the fact that they prevent the evapn. of P. The slowing effect in O at high pressures and in the presence of  $\text{H}_2\text{O}$  vapor seems to be due to the effect in O of an anticalyst and not to a film. It seems most probable that this negative catalyst consists of negatively charged mols. of O, since those gases which act as poisons are those which are capable of developing negatively charged O mols.

C. C. VAN VOORHIS

**Decomposition of oxalates on heating in vacuum.** I. Lead oxalate and suboxide of lead. Jos. ŠVĚDA. *Chem. Listy* 17, 47-50, 81-4, 112-5 (1923); cf. Denham, C. A. 11, 1799.—Pure  $\text{PbC}_2\text{O}_4$  prep'd. according to Stolba was heated in the vacuum produced by an oil and Hg pump. Air was totally excluded. The evolved gases were received in eudiometers,  $\text{CO}_2$  absorbed and the residue taken as CO. The residue after heating was treated with sufficient AcOH, 1 N, to dissolve the  $\text{PbO}$ , filtered, and  $\text{PbO}$  and Pb

were detd. separately as carbonate. When the residue was left in the vacuum of the Hg pump for 8 and 16 days, analysis showed it to contain 7 and 14% Hg which S. believes to have been "absorbed" by metallic Pb in finely divided state. Further expts. indicated reduction of  $PbO$  to Pb to be proportional to time of contact with the gaseous products. The expts. of Tanatar (*Z. anorg. Chem.* 27, 304(1901)) were repeated and varying amts. of  $Pb_2CO_3$  found in the products. The sp. gr. of the products from heating  $Pb_2CO_3$  to 300° in vacuum varied in 4 expts. 10.0773-10.1594. The ratio  $PbO$ :Pb was accurately proportional to the amt. of  $CO_2$  found. S. concludes that the product is an intimate mixt. of  $PbO$  and Pb and that  $Pb_2O$  is formed in no phase of the decompr.

MARIO KUBIN

**Studies on double decompositions between metals or metal oxides and carbon.** KURT NISCHK. *Z. Elektrochem.* 29, 373-90(1923).—A graphic representation is explained, by means of which the equilibria that occur in a chem. reaction in ternary and quaternary systems can be illustrated. The relative affinities of metals for C and O have been detd. by melting together the oxide with C. On the addn. of Cu to these reaction mixts. an alloy of Cu with the free metal is formed, the % of metal in the alloy depending on the affinity of the metal for C. On the reduction of the oxide, both in the presence and absence of Cu, Ba and Sr are completely changed to the carbide. With Ca and Mg small quantities of the metal alloy with the Cu, while with Be and Al several % of the metal dissolves in the Cu. B, Si, Ti, Cr and Mo exhibit a very great affinity for C. This is also true of Mn, which can, however, alloy with Cu. The tendency to form a carbide decreases steadily with the position of the metal in the periodic table, and is smallest in the case of Co and Ni. Microscopic investigation has shown that the carbides formed by Cr and Mo have the compn. expressed by the formulas  $Cr_3C$  and  $Mo_2C$ .  $CaC_2$  is a good reducing agent. A simple and cheap method is developed for the prepn. of alloys of Be, B, Si and Ti with Cu. H. JERMAIN CRIGHTON

## 7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

**By-product values in the study of quantitative analysis.** W. S. FROST. *Science* 58, 256-7(1923).—A statement of the advantages to be gained from an educational standpoint. W. T. H.

**An improved methyl orange.** J. MOIR. *J. S. African Chem. Inst.* 6, 69-70(1923).—An indicator similar to methyl orange can be prepd. as follows: Heat *o*-anisidine for 10 min. with 4 parts of concd.  $H_2SO_4$  at 120-130°. Cool, pour into water and neutralize with  $Na_2CO_3$  until the acidity is slight. Add 5%  $NaNO_2$  soln. until a moistened starch-iodide paper reacts 1 min. after the nitrite has been added. Dissolve an equiv. quantity of dimethyl-*o*-naphthylamine in 50 parts of alc., mix with 20 parts of satd. aq.  $AgNO_3$  soln., and add the above diazo soln. all at once. Nearly neutralize with  $NaCO_3$ . The new indicator, *p*-sulfo-*o*-methoxybenzenecarbazidomethyl-*o*-naphthylamine, seps. out as a powder with green fluorescence. It is sufficiently sol. in water and changes from orange to blue-violet with acid in day light and from deep yellow to red-purple in artificial light. The  $p_H$  range is from 4.9 to 3.5. With tap water it showed an alkalinity of 13.5  $CaO$  per 100,000 as against 14 by methyl orange and with greater alkalinity the values were the same. The indicator is more satisfactory than methyl orange under artificial light. W. T. H.

**The influence of alcohol on the sensitiveness of dye indicators.** I. M. KOLTHOFF. *Rec. trav. chim.* 42, 251-75(1923).—No satisfactory investigation of the dissociation relationships of various compds., but especially acids and bases, in  $H_2O$ -EtOH mixts. has been made. Some of K.'s results may be explained in conformity with known facts and from others important conclusions can be drawn. All of the EtOH used was freshly distd. from  $CaO$  to remove the acid present, which interferes. In all expts. with acid-sensitive indicators which show their color changes in alk. media the  $H_2O$  used was boiled out twice and freed from  $CO_2$ . Of the acid-sensitive indicators the following were investigated: Nitramin, tropolin O, thymolphthalein, phenolphthalein, thymolsulfonephthalein, and curcumin; of the alkali-sensitive indicators Me-orange, dimethyl yellow, tropolin OO, methyl violet, tetrabromophenolsulfonephthalein (bromophenol blue), and thymolsulfonephthalein (thymol blue); of those equally sensitive to acid and base (*i.e.*, with the neutral pt. at about  $p_H = 7$ ) *o*-naphtholphthalein, phenolsulfonephthalein, neutral red, azolitmin, curcumin, lacmoid, dibromo-*o*-cresolsulfonephthalein, *p*-nitrophenol, Na alizarinate and methyl red. Since the temp. has a large influence on the

results all expts. were done at 11–12°. When an aq. faintly alk. soln. of phenolphthalein is warmed the soln. becomes colorless but if the expt. is done with an EtOH soln. it becomes darker red. Conversely a faintly acid soln. of Me orange or dimethyl yellow becomes alk. with respect to these indicators when heated, while an EtOH soln. reacts more acid at higher temps. The sign of the temp. coeff. is therefore different in the 2 solvents. These results are discussed in detail in connection with graphs. K. concludes that indicators that behave like acids become more sensitive for H ions in the presence of EtOH regardless as to whether the indicator is acid- or alkali-sensitive. Thus in the presence of EtOH bromophenol blue, which reverses in acid soln., becomes more sensitive for H ions as well as phenolphthalein, which reverses in alk. medium. Conversely indicators that are weak bases become less sensitive for H ions in the presence of EtOH. Congo red is an exception to this rule since in the presence of EtOH it becomes less sensitive for H ions. This is due to the fact that even in H<sub>2</sub>O the Congo acid does not conform to the general theory of indicators. It is a fairly strong acid that is little sol. and gives a blue colloidal soln. in H<sub>2</sub>O. If a mol. soln. could be prepd. it would be red. In alc. it is much more sol. and gives a red soln. It is owing to this greater solv. in EtOH that Congo acid is less sensitive for acids in alc. than in water. The change of temp. in alc. solns. of indicators an effect opposite to that in aq. solns. On raising the temp. the dissociation consts. of acids and bases as well as the ionization consts. of H<sub>2</sub>O increase. Although the latter change is the greater in aq. solns. the results show that in alc. solns. the change is greater in the dissociation consts. of the acids and bases. The value of alc. error changes greatly with the temp. Various indicators have a max. or min. sensitiveness at a definite alc. concn. The existence of this max. or min. is explained from the different influence which the alc. exerts on the diminution of the dissociation consts. of the indicator acids or bases and on the ionization consts. of the H<sub>2</sub>O.

E. J. WITZEMANN

**Isatin as a microchemical reagent.** J. B. MENKE. *Rec. trav. chim.* **42**, 199–203 (1923).—The behavior of free isatin in neutral or acid soln. corresponds to the keto-lactum structure, but in alk. soln. and in the formation of metallic compds. it corresponds to an enol-lactum structure. On long standing H<sub>2</sub>O adds in alk. soln. giving the alkali salt of isatinic acid. The formation of the Ag salt in alk. and NH<sub>4</sub>OH soln. with AgNO<sub>3</sub> is described. Even low concns. of alkali retard the formation of isatinic acid and so a 5% NH<sub>4</sub>OH soln. with 0.5% isatin was used. Excess Cu<sup>+</sup> interferes. The Ag salt of isatin has no advantages over AgCl or Ag<sub>2</sub>CrO<sub>4</sub> as a microchem. test for Ag. The above NH<sub>4</sub>OH-isatin soln. with Cu<sub>2</sub>O (from Fehling soln. + lactose) gives characteristic microcrystals of the cupro-isatin compd. The same result is obtained with CuCl, CuI and CuCNS. Further tests showed that none of the other metals gives characteristic ppts. with the NH<sub>4</sub>OH-isatin reagent (even Li and Au<sup>+</sup>). The results described furnish another *micro method for sepn. Cu and Cd*. After pptn. of Ag, Hg and part of the Pb with HCl, the filtrate is satd. with H<sub>2</sub>S. Of the sulfides ptd. Hg<sup>2+</sup>, Pb<sup>2+</sup>, Cu<sup>+</sup> and Cd are insol. in (NH<sub>4</sub>)<sub>2</sub>S<sub>4</sub> and of these all but Hg<sub>2</sub>S are sol. in HNO<sub>3</sub>. Pb is removed from the soln. with H<sub>2</sub>SO<sub>4</sub> and after concn. of the filtrate Bi is removed as the basicsulfate. To the mixt. of Cu and Cd salts of nonoxidizing acids a weakly acid soln. of NH<sub>4</sub>CNS was added and NaHSO<sub>3</sub> (for example). In this way the Cu is removed quantitatively as white CuCNS. The Cd is detected in the filtrate with K<sub>2</sub>CrO<sub>4</sub>. The CuCNS ppt. is washed with a few drops of H<sub>2</sub>O and treated with the NH<sub>4</sub>OH-isatin soln.; the cupro-isatin compd. crystallizes out. The Cu is thus sepd. by the well known Rivot Rose method and detected with the isatin reagent.

E. J. WITZEMANN

**Observations on the use of potassium ferrocyanide in analysis.** C. PORLEZZA. *Ann. chim. applicata* **13**, 48–53 (1923).—In the analysis of U minerals by the method of Fresenius and Hintz (cf. *Z. anal. Chem.* **34**, 437 (1895)) either during the pptn. of U<sub>2</sub>Fe(CN)<sub>6</sub><sub>2</sub> or during filtering, a light blue ppt. often forms, even in the absence of Pcar Cu, in acid soln. (cf. Fusinieri and Tarugi, *Atti VI Congress internaz. chim. appl. Roma* 1906, 116; Tarugi, *Rend. soc. chim. ital.* **2**, 1910). This is proved to be due to the same general phenomenon characteristic of K<sub>2</sub>Fe(CN)<sub>6</sub> in acid soln., indicating that the methods of Fresenius and Hintz (*loc. cit.*), Browning (*C. A.* **15**, 640), Ohlmüller and Spitta (*Untersuchung u. Beurteilung des Wassers u. Abwassers*, IV, Ed. 139, Berlin, 1921) and Porter (*C. A.* **15**, 640) are unreliable under certain conditions. Expts. on the acidification of K<sub>2</sub>Fe(CN)<sub>6</sub> with HCl and H<sub>2</sub>SO<sub>4</sub> under varying conditions showed that decompn. occurred in darkness even in the presence of O so slowly that only after some months was a ppt. noticeable. But in sunlight (even in diffused light) in the presence of O, the color became green, and a light blue ppt. rapidly formed, with evolution of HCN. On treatment with excess NaOH the liquid again became yellow with pptn. of Fe(OH)<sub>2</sub>.

C. C. DAVIS

**Tables for sugar analysis.** G. D. ELDON. *Analyst* **48**, 435-43 (1923).—The wts. of dextrose, starch, levulose, lactose, maltose, invert sugar and cane sugar corresponding to every mg. of CuO from 100 to 400 mg. are given with the equiv. wts. of Cu and of Cu<sub>2</sub>O.

**The estimation of acidity.** J. M. LEWIS. *Proc. Roy. Soc. Victoria* **33**, 233-60 (1921); *Botan. Abstracts* **12**, 610. The electrometric method is discussed in detail.

H. G.

**The use of the quinhydrone electrode in place of the hydrogen electrode in potentiometric acidity determinations.** I. M. KOLTHOFF. *Rec. trav. chim.* **42**, 186-98 (1923). It has long been known that the H-ion concns. play an important role in many oxidation and reduction reactions. The oxidation potential of such a system is not only detd. by the relation of the oxidant to the reductant but also by the H-ion concn. The reaction may be represented thus:  $A + 2H^+ + 2e \rightleftharpoons AH_2$ . Granger (*Oxidation and Reduction in Organic Chemistry from the Standpoint of Potential Difference* (1920)), obtained good results using a quinhydrone electrode. Bühmann (*C. A.* **15**, 2074) showed that this electrode may be used in dext. H ion concn. in acid solns. Since the quinone and hydroquinone contents are equiv. the potential depends only on the H-ion concn. This electrode possesses advantages over the H electrode. It is more easily prep'd. A piece of Pt wire placed in the soln. contg. quinhydrone is all that is necessary. The potential is quickly established. This electrode may be used in various solns. in which the H<sup>+</sup> electrode is useless such as solns. of metallic salts, alkaloid salts, etc. The potential of this electrode does not depend on the H-ion concn. in alk. soln. The quinhydrone was easily prep'd. as recommended by Bühmann and Lund (*C. A.* **16**, 1097). Details on the use of this electrode are given. The results showed that the quinhydrone electrode gives excellent results in the titration of acid solns. and may be used in place of the H electrode. Alk. solns. cannot be detd. in the presence of air with the quinhydrone electrode because the quinhydrone is partially oxidized to an acid. When the quinhydrone electrode can be used a very simple set-up is adequate.

E. J. WITZEMANN

**Colorimetric determination of hydrogen-ion concentration by the method of Michaelis with one-color indicators, with inorganic solutions for color comparison.** I. M. KOLTHOFF. *Pharm. Werkblad* **60**, 949-66 (1923).—For  $\rho_H$  detns. in colorless or nearly colorless solns. with sufficient buffer capacity the indicators proposed by Michaelis are satisfactory. Owing to the weak buffer effect of drinking water and sea water, m-nitrophenol can be replaced to advantage here by other indicators, e. g., neutral red, phenol red or cresol red. For color comparisons K<sub>2</sub>CrO<sub>4</sub> solns. may be matched with 2,4-dinitrophenol and *p*-nitrophenol, and K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solns. with 2,5-dinitrophenol, *m*-nitrophenol and saicyl yellow. Optimum  $\rho_H$  ranges were found to be: 2,6-dinitrophenol 2.0-4.0, 2,4-dinitrophenol 2.6-4.4, 2,5-dinitrophenol 4.0-5.8, *p*-nitrophenol 5.6-7.6, *m*-nitrophenol 6.8-8.6, phenolphthalein 8.0-10.0, saicyl yellow 10.0-12.0.

A. W. DOX

**Volumetric method for the estimation of phosphorous acid in the presence of phosphoric acid.** A. WINGLER. *Z. anal. Chem.* **62**, 335-7 (1923).—Treat a measured quantity of the soln. contg. the mixed acids with a small excess of a satd. soln. of Br in water and leave the mixt. for 10 minutes in a dark place. Remove excess of Br by passing a current of air through the soln. until it becomes colorless. Titrate the liquid with 0.1 N NaOH soln. first with methyl orange then with phenolphthalein. The process may be represented by the equation: H<sub>3</sub>PO<sub>2</sub> + H<sub>2</sub>O + Br<sub>2</sub> = H<sub>3</sub>PO<sub>4</sub> + 2HBr. The first end point is obtained when all the HBr and 1/3 of the total H<sub>3</sub>PO<sub>4</sub> present are neutralized, and the second end point when another 1/3 of the H<sub>3</sub>PO<sub>4</sub> is neutralized. From these figures the amt. of each acid originally present is then readily calcd. J. C. S.

**Estimation of cyanamide.** ALESSANDRO NANUSSI. *Giorn. chim. ind. applicata* **5**, 168 (1923).—Treat 1 g. finely powdered Ca cyanamide while continuously agitating, with 200 cc. H<sub>2</sub>O and dil. HNO<sub>3</sub> up to a slight acid reaction, cooling at the same time. Filter from the C and so-called insol. N, wash well, bring the filtrate to slight alk. reaction with dil. NH<sub>4</sub>OH and ppt. the cyanamide with ammoniacal AcOAg [AgNO<sub>3</sub> is mentioned in another part of the article.—ABSTR.] soln. Filter, wash well until the ammoniacal reaction disappears. Introduce filter and ppt. into a 500-cc. Erlenmeyer flask, stir up with 100-200 cc. H<sub>2</sub>O, add NH<sub>4</sub>Cl soln. in excess, and add at once (to avoid loss of NH<sub>3</sub>) a measured excess of 0.5 N H<sub>2</sub>SO<sub>4</sub>. After 10 min. (during which agitate from time to time and break up the filter paper with a glass rod) titrate the excess of H<sub>2</sub>SO<sub>4</sub> with 0.5 N NaOH using Mc orange as indicator. Each cc. of H<sub>2</sub>SO<sub>4</sub> used corresponds to 0.007 g. N. The method compares well with the Kjeldahl, and requires very little time for its execution, while the Kjeldahl requires several hrs. R. S. P.

**Some observations on the sulfate-molybdate method of determining phosphoric oxide.** V. A. BECKLEY AND A. MARAIS. *J. S. African Chem. Inst.* **6**, 35-9 (1923). When a ppt. of  $\text{NH}_4$  phosphomolybdate is washed with 3% Na or K nitrate, there is danger of over-washing, particularly if the ppt. is allowed to remain dry for a time or if the ppt. is well churned by washing. After all the excess mineral acid is removed some  $\text{MoO}_3$  dissolves, as is shown by the fact that the acidity of the filtrate remains const., or increases, with prolonged washing and the results fall below the truth. To minimize these dangers, (a) wash 3 times by decantation with 3%  $\text{NaNO}_3$  soln. and in the subsequent washing transfer as much as possible of the ppt. to the filter without the use of the wash bottle; (b) use 20-cc. portions of wash liquid and disturb the ppt. as little as possible; (c) use a Gooch crucible as filter and apply suction so that 20 cc. of liquid run through in less than 1 min.; (d) after the 5th washing take care not to let the ppt. stand drained and (e) stop washing as soon as 10 cc. of the filtrate shows alkalinity to phenolphthalein upon addition of 0.05 cc. of 0.1 N NaOH. W. T. H.

**The direct determination of arsenic in toxicology.** J. LEWIS. *J. S. African Chem. Inst.* **6**, 65-8 (1923). A series of expts. on the detn. of As indicates that treatment with  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$  until fumes of the latter begin to appear is the most satisfactory method for destroying org. matter prior to the As test. Equally good results were obtained by simply boiling with 10%  $\text{H}_2\text{SO}_4$  without oxidation. In Green's method, in which  $\text{AsH}_3$  is made to react with  $\text{AgNO}_3$  soln. and the resulting arsensous acid titrated iodometrically, there are always some losses of As, aggregating about 0.1 mg.  $\text{As}_2\text{O}_3$  as a rule. W. T. H.

**An investigation into the chemistry of the Reinsch test for arsenic and antimony and its extension to bismuth.** B. S. EVANS. *Analyst* **48**, 358-67, 417 (1923). Numerous expts. are recorded showing how much the Reinsch test for As, Sb and Bi varies with different conditions. Most of the data agree with the assumption that the test is of electrolytic nature but the conclusion is drawn that a film of hydrogen in the so-called *nascent* condition is responsible for the reduction of As, Sb and Bi ions. W. T. H.

**Volumetric method for the determination of potassium.** M. BULLI AND L. FERNANDES. *Ann. chim. applicata* **13**, 46-8 (1923). The complex compnd.  $\text{K}_4\text{Pb}[\text{Co}(\text{NO}_3)_6]$  (cf. Cuttica, *C. A.* **17**, 3000) is used for pptg. and detg. K indirectly by a volumetric method. Evap. the soln. to a small vol., add, when cold, a large excess of  $\text{NaNO}_2$  (K free) and  $\text{Pb}(\text{NO}_3)_2$  (ether satd. solns. or solhd.) and a few  $\text{Co}(\text{NO}_3)_2$  or  $\text{CoCl}_2$  crystals. Allow the greenish black ppt., which forms slowly, to stand 3-4 hrs. (it is important to shake to prevent sticking), filter into a Gooch crucible, wash with  $\text{H}_2\text{O}$ , digest for 0.5 hr. with excess 0.1 N  $\text{KMnO}_4$  contg. a few drops of dil.  $\text{H}_2\text{SO}_4$ , heat slowly almost to boiling, and add more dil.  $\text{H}_2\text{SO}_4$ . Titrate hot with 0.1 N  $\text{Na}_2\text{C}_2\text{O}_4$  soln. The pale rose color of the Co ion does not inhibit the titration. If  $\text{MnO}_2$  ppt.s. during the heating add an excess of  $\text{Na}_2\text{C}_2\text{O}_4$ , heat till the  $\text{MnO}_2$  dissolves and add  $\text{KMnO}_4$  anew until the appearance of a permanent rose color. Calc. the result from the reactions:  $12\text{KMnO}_4 + 18\text{H}_2\text{SO}_4 + 5[\text{Co}(\text{NO}_3)_6]\text{PbK}_2 \rightarrow 6\text{K}_2\text{SO}_4 + 12\text{MnSO}_4 + 10\text{KNO}_3 + 5\text{Co}(\text{NO}_3)_2 + 5\text{Pb}(\text{NO}_3)_2 + 18\text{H}_2\text{O}$ . The soln. to be analyzed should not contain heavy metals or  $\text{NH}_4$  salts, though Mg, Ca, Sr and Ba do not influence the procedure. If much  $\text{SO}_4$  is present, it should be removed by a Pb salt. The soln. should be neutral or slightly alk. The following data show the accuracy (KCl weighed and found): 0.0700, 0.0708; 0.0700, 0.0694; 0.0667, 0.0659; 0.0688, 0.0683; 0.0714, 0.0708; 0.0708, 0.0720; 0.0802, 0.0808. C. C. DAVIS

**Volumetric method for the determination of magnesium.** M. BULLI AND L. FERNANDES. *Ann. chim. applicata* **13**, 44-5 (1923). The pptn. of  $\text{Mg}(\text{NH}_4)_2\text{Fe}(\text{CN})_6$  from solns. contg.  $\text{Mg}^{++}$  and  $\text{Fe}(\text{CN})_6^{4-}$  in the presence of  $\text{NH}_4$  salts is utilized for detg. Mg volumetrically. When cold, pptn. occurs only in concd. solns., but it is complete in hot dil. solns. with excess  $\text{NH}_4$  salt and EtOH, though a direct volumetric titn. could not be developed because of the difficulty of reading the end point. Filtration and detn. of the excess  $\text{K}_4\text{Fe}(\text{CN})_6$  with  $\text{KMnO}_4$  were not successful because of the difficulty of washing the ppt. and the formation of a ppt. of  $\text{Mn}(\text{NH}_4)_2\text{Fe}(\text{CN})_6$ . Procedure. To the Mg soln. add an excess of  $\text{K}_4\text{Fe}(\text{CN})_6$  and of solid  $\text{NH}_4\text{Cl}$ , heat at 100° for 5-10 min., add approx. 0.05 vol. of EtOH and while not titrate the excess  $\text{K}_4\text{Fe}(\text{CN})_6$  with 0.1 N  $\text{ZnSO}_4$ . The end point is reached when a drop of the supernatant liquid is not colored rose by a U salt. A drop of 0.1 N  $\text{ZnSO}_4$  is sufficient in the titration to transform the rose color to a clear green and the point is sharper than that in the titration of Zn by the method of Galletti. Calc. the Mg from the reactions:  $\text{MgSO}_4 + \text{K}_4\text{Fe}(\text{CN})_6 + 2\text{NH}_4\text{Cl} \rightarrow (\text{NH}_4)_2\text{MgFe}(\text{CN})_6 + 2\text{KCl} + \text{K}_2\text{SO}_4$ ;  $\text{ZnSO}_4 + \text{K}_4\text{Fe}(\text{CN})_6 + 2\text{NH}_4\text{Cl} \rightarrow (\text{NH}_4)_2\text{ZnFe}(\text{CN})_6 + 2\text{KCl} + \text{K}_2\text{SO}_4$ . C. C. DAVIS

**The analytical determination of iron in the presence of its oxides.** E. DIERSCHLAG. *Stahl u. Eisen* **43**, 1073-5(1923).—Three methods for the detn. of Fe and its oxides in the presence of one another were tested in the examin. of electrolytic Fe, various kinds of steel, *Jerrum reductum*, natural oxides and artificial preps. The method of Wüst-Kirpack (*C. A.* **16**, 4156) gave the most reliable results. Often, however, some FeO was converted to Fe<sub>2</sub>O<sub>3</sub> even with this method. The method of Mathesius (*Inaug. Dissert.* Berlin, 1913) gave good results in many cases but the method of Schneider (*Oester. Z. Berg-Hüttenw.* **48**, 257, 275(1900)) was found less reliable. W. T. H.

**The influence of the nature and position of substituents in aromatic nitro compounds upon Kjeldahlization.** B. M. MARCOSCHES, W. KRISTEN AND E. SCHEINOST. *Ber.* **56B**, 1943-50(1923); cf. *C. A.* **16**, 2281.—In a series of nitro-aromatic compds. attempts were made to det. the N content by 4 modifications of the Kjeldahl method, method—without catalyst, with K<sub>2</sub>SO<sub>4</sub>, with CuO and with HgO. The substances tested included mono-, di- and trinitrophenols, nitroanisoles, nitrophenetoles, nitrobenzoic acids, nitrobenzyl alcohols, and nitroanilines. In some cases all of the N was detd. accurately without catalyst, in some the catalyst had a helpful effect, but in others it was harmful. With most of the compds. tested, the results were low by all methods. If an OH group is *ortho* to the NO<sub>2</sub> group it is usually easy to get all of the N by the Kjeldahl method, if it is *para* it is practically impossible to do so. When the compd. contains CH<sub>3</sub> *meta* to NO<sub>2</sub> the results are nearest the truth. This influence of neighboring groups is borne out strongly with the dinitrophenols, in which the 1,2,6-deriv. was easily analyzed by the Kjeldahl method, whereas the values were far too low with the other 5 isomeric compds. tested. W. T. H.

**The determination of nitrogen in aromatic nitro compounds according to Kjeldahl-Flamand-Prager.** B. M. MARCOSCHES AND WM. KRISTEN. *Z. ges. Schiess-Spreng-stoffw.* **18**, 39-10(1923); cf. preceding abstract.—The modified Kjeldahl method of Flamand and Prager for azo compounds (*Ber.* **38**, 559-60) was applied to the detn. of N in a series of aromatic nitro compds. Dissolve 0.15-0.20 g. of the sample in 10 cc. EtOH in a 500-cc. Kjeldahl flask, reduced by heating with 0.5-1.0 g. Zn dust and 2-5 cc. of 12 N HCl. Add 10 cc. concd. H<sub>2</sub>SO<sub>4</sub> and 0.5 g. CuSO<sub>4</sub> and heat the mixt. until white fumes appear. Add 6 g. K<sub>2</sub>SO<sub>4</sub> and continue heating until the liquid is clear and light green (about 15 min.). Carry out the distn. and titration in the usual way. Increase the amt. of Zn, HCl and H<sub>2</sub>SO<sub>4</sub> according to the no. of nitro groups in the compd. A tabulation of results obtained shows that the method is accurate for nitrotoluene (1,4), nitronaphthalene, the dinitrobenzenes and dinitrophenols, dinitroxylene (1,2,3,4), dinitronaphthol (1,2,4), dinitrobenzoic acid (1,2,4 and 1,3,5), trinitroxylene, picric acid, trinitrobenzoic acid, nitrobenzoyl chloride, nitroaniline, nitroacetanilide and nitrotoluuidine (1,2,3). With dinitrotoluene (1,2,6), dinitroxylene (1,2,4,6), trinitroresorcinol (1,3,2,4,6) and nitrotoluuidine (1,4,2 and 1,4,3) the results were low by as much as 3% of the theoretical content of N, and with nitrotoluene (1,2 and 1,3) and nitrobenzyl chloride (1,2 and 1,3) up to 12% low. C. G. STORM

**The behavior of aromatic nitro compounds in the Kjeldahl process.** B. M. MARCOSCHES AND WM. KRISTEN. *Z. ges. Schiess-Sprengstoffw.* **18**, 73-8(1923).—N was detd. by the Kjeldahl-Flamand-Prager method (cf. preceding abstract) in *m*-nitrobenzenesulfonic acid, the three mononitrotoluenes and dinitrobenzenes, dinitrotoluene (2,4 and 2,6), dinitroxylene (1,2,4,6 and 1,3,2,4) and trinitroxylene (1,3,2,4,6). For comparison with these results other detns. were made on each compd., in which various reagents were added prior to the digestion with H<sub>2</sub>SO<sub>4</sub>. The addns. made to the 20 cc. H<sub>2</sub>SO<sub>4</sub> used were 10 g. K<sub>2</sub>SO<sub>4</sub>, 0.5 g. CuO or CuSO<sub>4</sub>, 0.5 g. HgO or combinations of these. A series of tabulations of results shows that digestion with H<sub>2</sub>SO<sub>4</sub> above gave approx. correct results only with 2,4- and 2,6-dinitrotoluene and 1,2,4,6-dinitroxylene; the addn. of K<sub>2</sub>SO<sub>4</sub> or HgO caused still lower results in every instance, while addn. of CuO or CuSO<sub>4</sub> as a rule gave higher results, although far from theoretical. The low results are attributed mainly to volatilization from the hot H<sub>2</sub>SO<sub>4</sub> soln., indicated by odor of nitrobenzene or by sublimations in the neck of the digestion flask. C. G. STORM

**Analysis of mixtures of alcohol, ether, and water.** M. MARQUEYROL AND E. GOUTAL. *Mem. poudres* **19**, 368-80(1922).—Complete  $\alpha_{D}^{25}$  data for mixts. of alc., Et<sub>2</sub>O and H<sub>2</sub>O covering all compns. are presented by means of a large triaxial diagram upon which the lines of equal d. are drawn for all homogeneous systems. The diagram also shows the boundary curve representing the locus of compns. at which sepn. into 2 phases takes place. By means of this diagram it is possible to det. the compn. of any mixt. contg. these 3 constituents by means of d. measurements only. The procedure consists in detg. the d. of the sample in its original condition and after the addition of a

known quantity of  $H_2O$  or  $Et_2O$ . Complete directions for using the diagram are given.

E. W. WASHBURN

**A new colorimetric determination of methanol.** A. B. LYONS. *J. Am. Pharm. Assoc.* **11**, 682-6 (1922).—In continuation of L.'s studies (cf. *C. A.* **16**, 1375) dried egg albumin is used in place of milk or peptone. The Chapin oxidation method ( $KMnO_4$ ) is used.  $H_3PO_4$  is employed instead of  $H_2SO_4$  and the time of oxidation extended to 30 min. In the test a highly dil. soln. of  $MeOH$  containing about 1% of  $EtOH$  is oxidized and 1 cc. is mixed with 1 cc. of  $H_2O$  containing 0.005-0.010 g. of egg albumin and 2 cc. of  $H_2SO_4$  containing a trace of  $FeCl_3$ . A purple color rapidly develops, reaching a max. intensity in 10 min. A color comparison is made with known amts. of  $MeOH$  and the quantity in the unknown estimated. Details are described to insure satisfactory manipulation.

L. E. WARREN

**Estimation of organic phosphorus.** E. J. BAUMANN. *Proc. Soc. Exptl. Biol. Med.* **20**, 171-3 (1922).—Some P is lost by volatilization when the Bloor or Bell and Doisy methods are used. This loss was prevented by using Greenwald's reagent (30% redistd.  $H_2O_2$ ). The material was oxidized in a large test-tube covered with a watch glass with 8 drops of  $H_2SO_4$  and 0.2 cc. of  $H_2O_2$  solns. Additional  $H_2O_2$  was added when necessary. The contents were then washed into an evapg. dish over a water bath and most of the water was removed; the estn. was then made colorimetrically by the process of Bell and Doisy. The method gave complete recovery from pure phosphate solns.

C. V. B.

**Determination of pyridine in ammonia liquors.** F. RINDEN. *Am. Gas J.* **119**, 200 (1923).—Acidify 500 cc. of crude gas liquor with  $H_2SO_4$ , make alk. with  $NaOH$  and dist. Repeat this process once. To 200 cc. of the distillate add about 100 cc. of  $NaOBr$  to oxidize the org. impurities and convert the  $NH_3$  to N, which escapes. Again dist. the soln., collect the distillate in 10 cc. of *N* HCl and titrate with *N* NaOH with a 1% soln. of methyl orange as indicator. Repeat this step if addition of 20-30 cc. of a soln. of  $NaOBr$  shows that  $NH_3$  is still present. The results of the titration are converted into g. of equiv. pyridine by multiplying the cc. of *N* HCl soln. used by 0.079. A slight modification of the method is used when concd.  $NH_3$  liquor is analyzed. J. L. W.

**Determination of formaldehyde in presence of substances found in formalin.** P. BORGSTROM. *J. Am. Chem. Soc.* **45**, 2150-5 (1923).—The effect of the addn. of  $MeOH$ ,  $EtOH$ ,  $HCO_2Na$ ,  $Me_2CO$  and  $HCH(OMe)_2$  to paraformaldehyde on the results of analysis of the latter by the iodometric (I), "alkali-peroxide" (II) and neutral sulfite (III) methods (*C. A.* **17**, 2544) has been studied. I can be used for the detn. of  $HCHO$  in the presence of  $MeOH$  and  $HCO_2H$ ;  $HCH(OMe)_2$  if pure, should have no effect; when  $EtOH$  and  $Me_2CO$  are present, I cannot be used. II can be used in the presence of  $MeOH$ ,  $EtOH$ ,  $HCO_2H$  and  $HCH(OMe)_2$ ; when  $Me_2CO$  is present in a concn. equal to that of the  $HCHO$ , the results will be about 2% high. III can be used in the presence of  $MeOH$ ,  $EtOH$ ,  $HCO_2H$  and  $HCH(OMe)_2$ ;  $Me_2CO$  introduces an error which cannot readily be corrected. C. A. R.

**Titrimetric determination of formic acid.** B. HOLMBERG AND S. LINDBERG. *Ber. 56B*, 2048-52 (1923).—If Na formate is heated with 2 mols. of  $HgCl_2$ , the latter is reduced to  $Hg_2Cl_2$  and 1 mol. of HCl is liberated for each mol. of Na formate present. The free acid formed in this way can be detd. by titration with phenolphthalein as indicator. To about 70 cc. of approx. 0.015 *N* formic acid soln. add 0.1 *N*  $Ba(OH)_2$  soln. until barely alk. to phenolphthalein. Add 5 cc. of the alk. soln. in excess and 15 cc. of 0.2 molar  $HgCl_2$  soln. Boil gently with a reflux condenser. If the soln. becomes decolorized in a few min., as it should, add 5 cc. more of  $Ba(OH)_2$ . Boil 1 hr. to effect the oxidation of the formic acid, cool, add 6-10 cc. of 0.1 *N* alkali bromide and titrate the excess  $Ba(OH)_2$  with 0.1 *N* HCl. After the first end point is obtained, boil off any  $CO_2$ , cool and again titrate. This method of analysis gives good results in the analysis of formic acid solns. even when another acid is present, such as acetic acid, which has only a slight reducing action on  $HgCl_2$ . W. T. H.

**Complete analysis of benzoates and salicylates by acidimetry and alkalimetry.** E. B. R. PRIDGAUX AND A. O. BENTLEY. *Pharm. J.* **110**, 427-30 (1923).—A quick and accurate method is given for the detn. of total alkali by ignition at a low temp. and boiling out the C with  $H_2O$  before completing ignition; ext. the ash, then titrate the combined solns. Two methods giving good results are described in detail for the detn. of both total alkali and total org. acid: (1) Ppt. the org. acid with definite excess of HCl, filter and then either (a) ext. the filtrate with  $CHCl_3$  and det. total acid as the sum of results in titrating the  $CHCl_3$  soln. and the pptd. acid (to det. total alkali, titrate the aq. portion) or (b) do not ext. with  $CHCl_3$ , but det. the excess of mineral acid and the dissolved org. acid in 1 operation by a 2-indicator method: For benzoates, use Me-

orange (*A*) or preferably bromophenol blue (*B*) for detg. the mineral, then phenolphthalein (*C*) for the org. acid. Salicylates, also  $\text{NH}_4\text{BzO}$ , are best detd. by method 1-*a*. (2) Titrate total alkali by standard acid, and the org. acid by standard alkali in the same soln. in the presence of  $\text{CHCl}_3$ , using suitable indicators and concns. selected according to the ionic behavior of the acids, which is discussed. For  $\text{NaBzO}$ , use *A* or *B* in titrating with *N* HCl; then add *C* and det. the liberated  $\text{BzOH}$  with NaOH. For Na salicylate (*D*) use tropolin 00 with HCl, then *C* with NaOH. Detailed pharmacopeial directions are finally suggested for  $\text{NaBzO}$  of 96%, *D* of 99.5% and  $\text{NH}_4\text{BzO}$  of 93% purity.

S. WALDBOTT

**Microscopic characterization of picrates and tartrates of potassium and sodium.** ED. JUSTIN-MUELLER. *J. pharm. chim.* **28**, 15-71 (1923).—Na picrate forms fine, long needles, K picrate long prisms; K tartrate mostly rhombic, with some roset crystals, Na tartrate octagonal plates and monoclinic prisms. All these forms are sketched.

S. WALDBOTT

American Society for Testing Materials standards (ANON.) **13**. Preventing and recognizing the forgery of writing (GANASSINI) **2**.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND EDW. F. HOLDEN

**Mineralogical notes. XI.** C. ANDERSON. *Rec. Australian Mus.* **13**, 201-12 (1922).—Comprises crystallographic data on diamond, anglesite (with new form, 368), pyrite, spessartite garnet, octahedrite, S. sphalerite, and azurite. E. T. W.

**Precious stones.** G. P. KUXZ. *Mineral Ind.* **31**, 586-610 (1922).—Imports, production in all countries, trade conditions, etc., are discussed with statistics. A. B.

**Stannite, its associated minerals and their paragenesis.** G. M. SCHWARTZ. *Am. Mineral.* **8**, 162-4 (1923).—Stannite has characteristic included minerals, which are practically the same for various regions. The paragenesis is usually: pyrite and arsenopyrite, wolframite, stannite and sphalerite, chalcopyrite, franckite. Stannite forms under rather definite and limited conditions, which accounts for its scanty occurrence. Irregularities in its analyses may be due to minute inclusions, e. g., Zn from sphalerite. E. F. H.

**Lubeckite, a cobaltiferous mineral from Miedzianka.** J. MOROZEWSKI. *Bull. intern. acad. sci. Cracovie, Class. I: Sci. Math.* **1918**, 185-90; *Mineralog. Abstr.* **2**, 52.—This occurs with other secondary minerals. It is colloidal, coming between malachite and asbolite. It forms small spherules or botryoidal aggregates in malachite, associated with a little native Ag. The color is black; streak, dark gray-brown; it is opaque; the structure is concentric shelly; hardness = 2-3; d. = 4.8. It is sol. in HCl with evolution of Cl. Analysis gave  $\text{CuO}$  50.1,  $\text{Co}_2\text{O}_3$  14.8,  $\text{MnO}_3$  24.2,  $\text{H}_2\text{O}$  10.9%, after deducting 59.28% admixed malachite. Formula:  $4\text{CuO} \cdot \text{Co}_2\text{O}_3 \cdot \text{MnO}_3 \cdot 4\text{H}_2\text{O}$ . E. F. H.

**Calcite from Varnitza near Khotine (Bessarabia).** P. I. GRISHCHINSKII. *Mém. Soc. Nat. Kiev* **25**, 1-9 (1916); *Mineralog. Abstr.* **2**, 96.—The pigment of reddish brown crystals is organic. Analysis:  $\text{CaCO}_3$  98.26,  $\text{CaSO}_4$  1.08,  $\text{MgCO}_3$  0.46,  $\text{SrCO}_3$  trace,  $\text{FeCO}_3$  nil, N nil, sum 99.80%. E. F. H.

**Department of calcites toward radium radiations.** W. P. HEADDEN. *Am. J. Sci.* **6**, 247-61 (1923); cf. *C. A.* **17**, 2095.—Ra excites in both yellow and purple Missouri calcites in their natural condition an orange phosphorescence, also in the heated samples. The  $\alpha$ -rays did not excite either form in natural condition nor in decolorized cleavage pieces, but after powdering to 50-mesh size and heating produced white luminescence. The  $\gamma$ -rays excited phosphorescence in both calcites and also in burnt lime; and in 7 other calcites in their natural conditions and 20 decolorized by heating. The  $\beta$ - and  $\gamma$ -rays jointly excited phosphorescence in all of the Missouri samples whether in their natural condition or heated. Cathode rays produced orange phosphorescence in 10 samples, including yellow, which shows on insolation yellow and not orange phosphorescence. This property is apparently common to many if not all calcites. Ra (or its emanation) imparts a yellow color to samples decolorized by heating. Remote pieces may be only faintly colored, but react the same as the strongly colored ones. The emanation colored the calcites uniformly, so as to appear yellow by daylight but violet by lamp, if originally purple. All samples exposed to Ra or emanation become phosphorescent on insolation, orange with a duration of 4 hrs. in the Mo. samples. These are also thermoluminescent in 2 phases. The first phase begins at about 70° and can be exhausted in 10-2 min.; the 2nd phase begins at a much higher temp. but far below incipient red-

ness, and is exhausted in 20–5 min. in most samples, but lasted 55 min. in one. Some of these may be revived properties, but others are certainly new. The natural purple calcite is not phosphorescent on isolation but after having been decolorized and then colored yellow by the emanation it is very sensitive. These calcites submitted to Ra radiation are changed in color, if not already yellow, and become responsive to sunlight. Their deportment on heating is modified, their luminescence at lower temp. being increased. Some naturally colorless calcites are colored yellow by Ra radiations, while others are not, some unresponsive to sunlight are rendered responsive, others are not. Some calcites that do not luminesce at any temp., in their natural condition, are not changed by radiation.

L. W. RHEES

**Baikalite.** O. Y. VOIR. *Coll. Mineral. Geol. Cabinet Moscow Univ.* 1916, 82: 3. — Analysis of diopside from Eremyéev's mine in Kusinskaya estate. *Ibid.* 81: 5; *Mineralog. Abstr.* 2, 68.—Green baikalite gave: SiO<sub>4</sub> 53.89, Al<sub>2</sub>O<sub>3</sub> 0.82, Fe<sub>2</sub>O<sub>3</sub> 0.76, FeO 3.11, MgO 16.01, CaO 26.06, ign. 0.05, sum 100.70%; the mean of 2 analyses of yellow massive diopside from Kusinsk. Govt. Ufa: SiO<sub>4</sub> 52.30, Al<sub>2</sub>O<sub>3</sub> 3.52, Fe<sub>2</sub>O<sub>3</sub> 0.74, FeO 1.81, MgO 15.41, CaO 26.34, ign. 0.43, sum 100.58%. E. F. H.

**Crystals of pyroxene from the district between Suram Pass and Zvar Gorge (Caucasus).** S. F. GLINKA. *Coll. Mineral. Cabinet Moscow Univ.* 1917, 11: 6; *Mineralog. Abstr.* 2, 65.—Black twinned crystals, with Fe<sub>2</sub>O<sub>3</sub> 1.27, and ign. 3.32–3.33, had forms *a,b,m,s,n,c,o* (Dana's letters); angles are given. E. F. H.

**The scapolite deposit of Bolton, Mass.** C. PALACHE AND A. W. PINGER. *Am. Mineral.* 8, 153–7 (1923).—This occurrence is in an abandoned limestone quarry. A thick layer of scapolite lies beneath gneiss. It grades into a diopside actinolite rock, followed by boltonite-rich limestone. Below these beds is normal magnesian limestone. At several pits are dike-like quartz-scapolite masses, interpreted as scapolite pegmatites. Several minerals are described. E. F. H.

**Studies on a new mineral, kochite.** SHIKISEI KOZU, KUNIRATSU SEITO, AND KAMEKI KINOSHITA. *J. Geol. Soc. Tokyo* 29, 1–16 (1922).—Dehydration of kochite in aqueous vapor at atmospheric pressure. S. KOZU AND SATORURO SAKI. *Ibid.* 148–54; *Mineralog. Abstr.* 2, 51. Kochite was found in Kochi-mura, province of Rikichū, Japan. It formed a granular aggregate of cubic crystals, up to 0.05 mm., with the forms (111) and (100). Its sp. gr. = 2.929,  $n_D^{20}$  = 1.590. Analysis gave: SiO<sub>4</sub> 36.94, Al<sub>2</sub>O<sub>3</sub> 11.13, Fe<sub>2</sub>O<sub>3</sub> nil, CaO 0.50, MgO 0.04, TiO<sub>2</sub> 0.06, P<sub>2</sub>O<sub>5</sub> trace, H<sub>2</sub>O 18.91, sum 100.61%; formula 2Al<sub>2</sub>O<sub>3</sub>·3SiO<sub>4</sub>·5H<sub>2</sub>O. Heated in air the H<sub>2</sub>O is rapidly given off, at 725–800°. In aqueous vapor at atm. pressure most of it is liberated at 775–950°. Details of dehydration are given. E. F. H.

**The formation of kaolin at moderate depths.** A. L. PARSONS. *Am. Mineral.* 8, 157–62 (1923).—The feldspars and feldspathoids are the principal minerals from which kaolin may be formed. Carbonic acid is regarded responsible for most of the kaolinization of surface deposits. In a kaolinized dike at the Helen Fe mine (Ont.) CO<sub>2</sub> was liberated by the oxidation of a large body of siderite, the Fe forming goethite. The source of CO<sub>2</sub> in the kaolin deposits at Huberdeau, Que., was probably a crystalline limestone, sep'd. from the kaolinized granite and gneiss by a shattered quartzite. E. F. H.

**Delessite from the neighborhood of the Kvartzhany copper deposit in Batum district.** N. I. BEZBORODKO. *Bull. Acad. sci. Petrograd* [6] 10, pt. 1, 47–51 (1916); *Mineralog. Abstr.* 2, 65.—Delessite occurs in amygdalites in amosite andesite, also with feldspars in small veins in the rock, and as isolated scales in the groundmass. It is pleochroitic with X pale yellow, Y and Z grass-green; extinction angle 7°; birefringence 0.012; optically — with 2V small. Analysis: SiO<sub>4</sub> 27.86, Al<sub>2</sub>O<sub>3</sub> 15.78, Fe<sub>2</sub>O<sub>3</sub> 15.27, FeO 18.87, CaO 0.85, MgO 15.91, H<sub>2</sub>O at 100° 0.81, ign. 0.26, sum 99.61%. E. F. H.

**Staszcite, a new mineral from the copper mine at Miedzianka.** J. MOROZIEWICZ. *Bull. Intern. Acad. sci. Cracow, Class A: Sci. Math.* 1918, 4–16; *Mineralog. Dok.* 2, 51.—Staszcite occurred with other secondary Cu ores and primary sulfide in the old Cu mine at Miedzianka, 19 km. w. of Kielce, Poland, which was reopened in 1917. It formed yellowish green compact masses of a radially fibrous structure. B. 5.5 6, d. 4.227; extinction parallel, elongation +; presumably orthorhombic. Analysis: As<sub>2</sub>O<sub>3</sub> 38.77, CuO 26.45, ZnO 7.30, CaO 20.80, Fe<sub>2</sub>O<sub>3</sub> 6.63, MnO 0.11, MgO 0.27, H<sub>2</sub>O 5.56, SiO<sub>2</sub> 0.14, sum 100.06%; formula R<sub>2</sub>As<sub>2</sub>O<sub>5</sub>·2R<sub>2</sub>OH<sub>2</sub>, analogous to erinite, but with Ca/Cu: Zn = 4: 3.5: 1. It loses 1.5 H<sub>2</sub>O at 500–600°, 0.5 H<sub>2</sub>O at 800–880°; fuses at 880°. It is an alteration product of tennantite in the presence of Cu. E. F. H.

**Occurrence of radioactive minerals in Fergana.** V. I. LUCURZKII. *Proc. Soc. Naturalists (Kiev)* 1915, 17; *Mineralog. Abstr.* 2, 93. The main deposit is on the left bank of the Aryan river, near Tyuya-Muyun, in Fergana, Turkestan. The radioactive

minerals, principally tyuyamunite and fergusonite, occur with calcite and barite, also malachite and azurite, in a cavern in limestone. E. F. H.

**An occurrence of carnotite near Denver.** J. H. WILSON. *Eng. Mining J.-Press* 116, 239-40(1923).—The area contg. the deposit is about 12 miles northwest of Denver. Carnotite was discovered here during the examn. of a coal mine in 1874. It occurs as yellow incrustations and inclusions in fractured and partly silicified coal of Laramie age. The formations are nearly vertical at this place and fracturing probably took place at time of folding. The quartz veins in the coal are probably genetically related to the carnotite. The deposit is not of com. importance. W. H. NEWHOUSE

**The pallasites (summary).** P. N. CHIRVINSKII. *Bull. Inst. Polytechn. Don* 6, sect. 2, suppl., 19 pp.(1918); *Minerolog. Abstr.* 2, 834.—This is a summary of a large unpublished monograph on pallasites. The mean compn. of Ni-Fe from pallasites is: Fe 88.86, Ni 9.80, Co 0.55, Cu 0.06, Mn 0.04, S 0.17, P 0.14, C 0.31, Cl 0.07%; sp. gr. 7.70, equiv. at wt. 55.34; of olivine: SiO<sub>2</sub> 39.35, FeO 14.39, MgO 45.93, MnO 0.08, NiO 0.02, CaO 0.03, Na<sub>2</sub>O 0.02, Al<sub>2</sub>O<sub>3</sub> 0.09, Fe<sub>2</sub>O<sub>3</sub> 0.06%; sp. gr. 3.38, mol. wt. 150.5, formula 5.7 Mg<sub>2</sub>SiO<sub>4</sub>·Fe<sub>2</sub>SiO<sub>4</sub>. The bulk-compn. for 17 pallasites, a mean which takes into account the wt. of each fall, is: SiO<sub>2</sub> 19.19, FeO 7.02, MgO 22.40, Fe 45.53, Ni 5.02, Co 0.28%; sp. gr. 4.74, olivine 48.76, Ni-Fe 51.24. The at. %'s of metals and non-metals is 48.97 and 51.03, resp.; i. e., practically equal nos. of atoms. E. F. H.

**The New Baltimore, Somerset County, Pennsylvania, meteoric iron.** Supplemental note. G. P. MERRILL. *Am. J. Sci.* 6, 262-4(1923); cf. *C. A.* 17, 1610.—The iron has a coarse irregularly granular structure, the individual granules varying in size up to 40 or more mm. These, while closely interlocking, fall away on weathering to a coarse metallic gravel. On subjecting the granules to polishing and etching the hexahedral structure and Neumann lines were always shown. A larger polished surface brought out an unusual structure in which the coarsely granular portion was bordered by somewhat undulating kamacite plates so arranged as to suggest octahedral structure but with no intervening taenite or plessite fields. A portion of the mineral was split off and, after polishing and etching of all sides to insure its uniform structure, analysis by Whittlefield, gave: Fe 93.02, Ni 6.38, Co 0.43, sum 99.83%. One section of the mineral shows a small fault with a throw of about 1 cm., which may have been caused by some sudden shock occurring when the Fe was rendered brittle by intense cold. The Fe is classed provisionally in Berweth's kamacite-octahedrites, group "KO." L. W. RIGGS

**Mineral statistics.** ANON. *Mineral Ind.* 31, 802-84(1922).—Tables of production, imports and exports in various countries. A. B.

**Mineral resources of the United States in 1922 (Preliminary summary).** G. F. LOUGHIN and MARTHA B. CLARK. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1922, Pt. I, 124 pp. (preprint publ. Aug. 15, 1923). E. J. C.

**Economic deposits in Thunder Bay district.** A. L. PARSONS. *Ann. Rept. Ont. Bur. Mines* 30, pt. 4, 27-38(1921); *Minerolog. Abstr.* 2, 94-5.—The following are treated: description of the Kaministikwa Fe range; methods for delg. approx. % Fe in ores by sp. gr.; Ag deposits and associated minerals; origin of ores; description of Silver Islet and Federal mines; the nature of *macfarlanite*; calcite. E. F. H.

**New ore of the East Mesabi range.** G. M. SCHWARTZ. *Eng. Mining J.-Press* 116, 409-12(1923).—The new ore is found near Babbitt. It is a magnetic ore in the Biwabik formation. Magnetite, quartz, and amphibole form the bulk of the ore, with the gang having a 2 : 1 ratio to the magnetite. This rock is called taconite. Work on polished sections of the ore show that the magnetite has been formed from hematite, which substantiates field evidence. The ore runs 20-30% magnetite. New methods of concg. make possible its com. use. W. H. NEWHOUSE

**Iron ore in the Dutch East Indies.** ALEX. L. TER BRAAKE. *Eng. Mining J.-Press* 115, 1158-9(1922).—A limitic clay ore formed by leaching MgO and SiO<sub>2</sub> from serpentine rock is found near Larona. The principal deposit covers 3,800 acres. This lateritic ore has an av. depth of 40 feet. The top 7 feet is composed of hard dark brown and black ore, while below is found yellow soft ore, which at about 37 to 40 ft. grades into serpentine. W. H. NEWHOUSE

**The argillaceous iron ores of Starachowic.** W. PAWLICA. *Bull. serv. géol. Pologne* 1, 1-52(1920); *Minerolog. Abstr.* 2, 94.—Thin bedded clayey Fe ores are mined at Starachowic and elsewhere near Radom in central Poland. They consist of minute crystals of siderite in clay. Mean analysis: carbonates 68.3, clay 27.7, Fe oxides 2.6%; Fe 30, Mn 1%; sp. gr. 3.28-3.52. The ores occur in a sandstone, which carries a large no. of heavy accessory minerals. E. F. H.

**The iron mines of Nurra (Sardinia).** C. MARTELLI AND T. SOTGIA. *J. Iron*

*Steel Inst.* (advance proof) 1923, 7 pp.—The Murra district is in n. w. Sardinia. The Fe ore is a sideritic chamosite of sedimentary origin, with an oöditic structure. It occurs in beds in argillaceous rocks, associated with basic eruptives. The compn. is 40.6% Fe, 11.5 SiO<sub>2</sub>, 0.7 P, 0.03–0.50 S. The main mass contains two beds of 25 m. total thickness. The probable tonnage of ore is 10 million. Mining methods are described. E. F. H.

**Schreiber-Duck Lake area.** P. E. HOPKINS. *Ann. Rept. Ont. Bur. Mines* 30, pt. 4, 1–26 (1921); *Mineralog. Abstr.* 2, 94.—The economic products of the area are Au, chalcopyrite, pyrrhotite, sphalerite, pyrite, and pebbles for tube mills. Mines and prospects are described. E. F. H.

**Opasatika map area, Timiskaming County, Quebec.** H. C. COOKE. Can. Dept. Mines, *Summary Rept.* 1922, Part D, 19–71 (1923). Au was discovered in this area in 1906. During the following 7 years a little work was done which ceased in 1911. Discoveries of Au in this area in 1922 caused new work to be started on several claims. Search for new ore bodies will be best carried on by an examin. of belts of schists or shattered rock and of masses of porphyry. Sufficient work has not been done to warrant a prophecy as to the outlook. **Duparquet map area, Quebec.** W. F. JAMES. *Ibid* 75–96.—This area which lies a short distance south of lake Abitibi, contains a heavy timber growth. The land is fertile, largely clay, and after the removal of the forests is well adapted to agriculture. L. W. RIGGS

**Brockville-Mallorytown map-area, Ontario.** J. F. WRIGHT. Can. Dept. Mines, *Memoir* 134, pp. 59 (1923); cf. *C. A.* 16, 542.—The principal economic minerals of this area are pyrite and chalcopyrite. Several prospects were formerly worked. L. W. RIGGS

**Palladium-bearing nickel deposit at Shebandowan lake, Thunder Bay district, Ontario.** T. L. TANTON. Can. Dept. Mines, *Summary Rept.* 1922, pt. D, 1–8 (1923). The mineral occurrence is a replacement deposit of sulfides in Kewatin schists and associated intrusive acidic dikes. It is found in narrow seams in a zone parallel to the contact of a granitic batholith, and from 50 to 150 ft. away from it. Analyses of 5 samples representing 4 pits are recorded, each contg. Pd and Pt. The sample with the highest Pd content contained: insol. 16.40, Fe 35.65, Cu 1.50, Ni 5.95, Co 0.20, S 29.25%, Au 0.01 oz. per ton, Pt 0.04, Pd 0.12. **Gold occurrence at Makwa, Sudbury district, Ont.** *Ibid* 9–12.—The best showings of Au occur 40 chains east of the railroad bridge over Mollie river. The quartz contains a small amt. of Au, but spectacular showings are associated with limonite in joint planes. Assays gave \$160 per ton. Notwithstanding the presence of large grains of Au in the limonite, the surface indications do not indicate the presence of Au in cont. quantities. Investigation of peat bogs in Quebec. A. ANREP. *Ibid* 13–8.—Four bogs were surveyed, 3 being situated not far from the city of Quebec, and one 20 miles northwest of Montreal, making a total area of 3460 acres. The 3 bogs in the vicinity of Quebec are estd. to contain 1,553,000 tons of fuel peat contg. 25% of moisture, excluding portions of bogs less than 5 ft. in depth. The N content of these bogs is quite uniform, being about 1.6%, while the ash content varies from 2.0 to 33.8% in the 3 bogs. The bog near Montreal was estd. to contain 160,000 tons of peat having 25% of moisture. This amt. was reduced by the fires of 1922. The peat averages only 3 ft. in depth, which is not deep enough for the profitable production of peat by the present methods. L. W. RIGGS

**A big zinc mine in New York State.** W. R. WADE AND ALFRED WANDKE. *Eng. Mining J.-Press.* 116, 95–9 (1923).—The deposit is located at Edwards, in the northern part of the state. The ore minerals are sphalerite and pyrite with small apts. of galena, pyrrhotite, and chalcopyrite. Gang minerals are diopside, calcite, talc and serpentine. The ore minerals are considered of magmatic origin and to have been introduced into their present position in the Grererville limestone by hot solns. The ore bodies are probably connected genetically with adjacent pegmatitic dikes. W. H. NEWHOUSE

**Deposits of molybdenite in the Selengan Dauria.** A. E. FIGERMAN. *Ore Messenger* 1, 78–9 (1916); *Mineralog. Abstr.* 2, 91.—Molybdenite with sometimes other minerals (sphalerite, pyrite, and chalcopyrite) is found in thin quartz veins penetrating granite along the Chikoi river in Transbaikalia. E. F. H.

**The occurrences of tungsten and tin in the district of Onon-Borzia, Transbaikalia.** M. M. TETYABY. *Comité géol., Matériaux pour la géol. général et appliquée* No. 32, 128 pp. (1918); *Mineralog. Abstr.* 2, 89–90.—The Sn and W ore (wolframite, scheelite and cassiterite) veins are in granite, sometimes extending into surrounding metamorphic rocks. They are symmetrically banded. At Schorl Mt. the veins are of pneumatolytic origin, elsewhere hydrothermal. Associated minerals are tourmaline, topaz, beryl, fluorite and sulfides. E. F. H.

**Sketch of the deposits of tungsten and tin ores in Russia.** P. P. SUSHCHINSKII. *Matter concerning the natural productive forces of Russia 1916*, No. 5, 95 pp.; *Mineralog. Abstr.* 2, 89. All known Russian occurrences of W and Sn ores are fully described. Those of Transbaikalia are most important. At Boevka in the Urals hübnerite and scheelite occur in quartz veins in amphibolites. Wolframite from Khar-Nor, Transbaikalia gave:  $WO_3$  76.02,  $FeO$  9.82,  $MnO$  12.95,  $SiO_2$  0.73,  $CaO$  0.14,  $TiO_2$  0.29,  $Al_2O_3$  0.17, sum 100.12%. Sn ore is found at Pitkäranta in Finland, on the Onon river and other localities in Transbaikalia. E. F. H.

**Chemical composition of the phosphorite of the island of Juan-de-Nova (Madagascar).** J. ORCET. *Bul. écon. Madagascar* 18, 167 (1921); *Expt. Sta. Record* 48, 822.—Chem. studies of samples of the phosphorites of the island of Madagascar are presented and briefly discussed. These show a content of  $Ca_3(PO_4)_2$  of about 73% and a free  $CaO$  content of 8.45%. H. G.

**The phosphorites of Ukraine.** V. N. CHIRVINSKII. *Matter concerning the natural productive forces of Russia, Russ. Acad. Sci.* No. 30, 52 pp. (1919); *Mineralog. Abstr.* 2, 534. A mineralogical, geological, chem. and economic discussion. The deposits occur in Podolia, Bessarabia, Volhynia, Kiev, Ekaterinoslav, Kharkov, Poltava, and Chernigov. An analysis is given of black phosphorite nodules from between Razlety and Vishenki, on the Desna river in Chernigov, giving  $2Ca_3P_2O_7 \cdot CaF_2 \cdot CaCO_3$ . Ch. previously found the same compn. for a cryptoctyst. phosphate from Kursk, Russia. The name *kurskite* is proposed for these. E. F. H.

**Petrographic description of the phosphorites of Daghestan.** P. N. CHIRVINSKII. *Bull. Inst. Polytechn. Don* 5, Sect. 3, 19-23 (1916); *Mineralog. Abstr.* 2, 92.—Phosphorite nodules occur in glauconitic marl in Daghestan, Caucasus. Analyses of the nodules and enclosing rock are given. Associated fossils (ammonites) averaged 21%  $P_2O_5$ . E. F. H.

**The quantity of glauconite in the phosphorites of Malo-Nesvetyai, Don region.** P. N. CHIRVINSKII. *Bull. Inst. Polytechn. Don* 5, Sect. 3, 24-35 (1916); *Mineralog. Abstr.* 2, 92. Seven thin sections of phosphorite nodules were measured for vol. % and no. of grains of glauconite. The mean of 384 readings was 2.68% and 2.294 grains/cc. The  $K_2O$  content of the nodules is estd. at 0.18%. E. F. H.

**Magnesite in the district of the Chemernitsa.** D. JOVANOVIC. *Ann. géol. pénins. Balkan* 7, 110 (1922); *Mineralog. Abstr.* 2, 94.—Magnesite veins, 3-5 m. thick and extending for 6.7 km., occur in serpentinite on the left bank of the river Chemernitsa in the dept. Rudnik, Serbia. Analysis:  $MgO$  42.7,  $CO_2$  46.52,  $CaCO_3$  0.20-0.85,  $FeO$  0.5-1.5,  $SiO_2$  1.5,  $H_2O$  1.2%. The quantity at present explored is estd. at 6 million tons. E. F. H.

**Asbestos in the eastern Sayan Mts.** V. LODOCHNIKOV. *Ore Messenger* 1, 29-30 (1916); *Mineralog. Abstr.* 2, 92. A deposit of chrysotile asbestos occurs in serpentinite boss in the Tunkinsky commune, Irkutsk govt., Siberia. The veins are best developed in greenish and bluish serpentine. The fibers attain a length of 2½ in. E. F. H.

**Deposit of muscovite in the neighborhood of the settlement Chudnov, Volhynia govt.** P. I. GRASCHINSKII. *Ore Messenger* 1, 18-21 (1916); *Mineralog. Abstr.* 2, 91. Large crystals of muscovite are found in a pegmatite. Thousands of pounds of quartz and feldspar have been mined here during the last few years. E. F. H.

**The geology of glass sands.** H. W. ELKINGTON. *Rock Products* 26, No. 19, 28-30 (1923).—An account of the geological processes which have produced sand suitable for glass manufacture. Sorting by wind is most efficient. E. F. H.

**The weathered residue in the northwest Bohemian lignite region.** HANS FLEISCHNER. *Rundschau* 15, 1-5 (1923).—A description is given of the clays occurring above and below the lignite deposit. E. T. ERICKSON

**Diamond deposits in Arkansas.** G. J. MITCHELL. *Eng. Mining J.-Press* 116, 285 (1923). The locality is 2½ miles southeast of Murfreesboro, Arkansas. Peridotite forms an entcrop of 60 acres with sandstone and tuff inclusions; it is of the kimberlite variety, dark colored, hard and compact with altered olivine crystals as the most abundant mineral present. Olivine forms phenocrysts in a groundmass of small augite, perovskite, biotite and magnetite crystals. Kimberlite tuff with many inclusions is present in highly altered state. Over 4000 diamonds have been found ranging from chips to 6 carats. The crystal form is commonly the hexoctahedron. The color varies from brown or yellow to white or blue-white. They occur in the decomposed rock covering the kimberlite. W. H. NEWHOUSE

**The prospects of discovery of salt deposits in the East European district of the Devonian old red sandstones.** H. SCUPIN. *Kali* 17, 161-6, 177-82 (1923).—The history of salt wells and springs in this district is reviewed. The no. of these, together

with certain geological features occurring in this region, indicates the probable existence of salt deposits.

**A study of the work on the origin of Chilean nitrate.** ANON. *Caliche* **4**, 392-5 (1922).—A comparison of the phosphate content of caliche with that of the surrounding volcanic rock.

**The formation of salts on the Pampa.** E. A. ARROYO. *Caliche* **4**, 396-9 (1922).—A discussion relating the dryness of the air with the salt deposits.

**The southern part of the Sydney coal field, Nova Scotia.** A. O. HAYES AND W. A. BELL. Can. Dept. Mines, *Memoir* **133**, 1-89 (1923).—An extended survey of the principal seams of coal in this region is reported in detail. Apparently the coal reserves total several hundred million tons.

**Stratigraphy of Great Bras d'Or coal district, Victoria County, Cape Breton.** *Ibid.* **90** 101.—A survey of this district indicates a

possible reserve of 35 million tons of coal.

**The signification of alkaline granites very rich in sodium.** A. LACROIX. *Compt. rend.* **177**, 417-22 (1923).—Chem. analyses of 22 samples of granites rich in Na are recorded, and their lithologic origins and relations discussed.

**The constitution of the Rockall bank.** A. LACROIX. *Compt. rend.* **177**, 437-40 (1923).—The islet of Rockall, situated northwest of Ireland, is raised upon a submarine bank about 70 by 30 miles in extent. Analyses of 6 rock samples from different portions of the bank are recorded and the relations of its basalt, trachyte and granite discussed.

L. W. RIGGS

**Comparison of the chemical composition of two Icelandic lavas characterizing different modes of eruption.** A. LACROIX. *Compt. rend.* **177**, 369-73 (1923).—Lavas from the explosive eruption of Katla volcano in 1918 and from the great but quiet eruption of 1783 are compared as to their chem. and lithologic compon., and modes of formation. Chem. analyses by Raoult give for the compn. of lavas of 1918 and 1783, resp.:  $\text{SiO}_2$  47.68, 49.56;  $\text{Al}_2\text{O}_3$  12.51, 10.36;  $\text{Fe}_2\text{O}_3$  3.14, 7.01;  $\text{FeO}$  12.31, 8.19;  $\text{MgO}$  5.25, 6.04;  $\text{CaO}$  9.58, 11.66;  $\text{Na}_2\text{O}$  2.33, 1.86;  $\text{K}_2\text{O}$  0.88, 0.63;  $\text{TiO}_2$  5.01, 4.16;  $\text{P}_2\text{O}_5$  0.23, 0.06;  $\text{H}_2\text{O}$  + 0.41, 0.29;  $\text{H}_2\text{O}$  = 0.15, 0.25, sums 99.97, 100.10%.

L. W. RIGGS

**Syenite porphyry from the River Chu.** D. S. BYELYASKIN. *Bull. Petrograd Politechn. Inst.* **27**, 83-100 (1918); *Mineralog. Abstr.* **2**, 75-6.—The rock contains phenocrysts of Na-K feldspar in a groundmass of 60% anorthoclase, 20 plagioclase, 11 biotite, 0.8 hornblende, 0.9 diopside, 1.4 magnetite, quartz absent or trace. The optical properties of the phenocrysts vary in different crystals and in different parts of the same individual. Orthoclase:  $2V = 72.84^\circ$ . Anorthoclase: central portions,  $2V = 44.64^\circ$ ;  $\alpha 1.5305$ ,  $\beta 1.5205$ ,  $\gamma 1.5215$ ; margins,  $2V = 60.72^\circ$ ,  $\alpha 1.5305$ ,  $\beta 1.5285$ ,  $\gamma 1.5215$ . Analysis of the latter anorthoclase gave:  $\text{SiO}_2$  63.23,  $\text{Al}_2\text{O}_3$  20.32,  $\text{Fe}_2\text{O}_3$  0.51,  $\text{BaO}$  0.55,  $\text{CaO}$  1.48,  $\text{MgO}$  0.06,  $\text{Na}_2\text{O}$  3.75,  $\text{K}_2\text{O}$  10.28,  $\text{H}_2\text{O}$  = 0.19, ign. 0.31, sum 100.74%.

E. F. H.

**Some ore-bearing dike-rocks of the porphyrite massif of Chelyabinsk (Ural).** I. PAZLOV. *Coll. Mineral. Geol. Cabinet Moscow Univ.* **1916**, 49-56; *Mineralog. Abstr.* **2**, 76.—Microscopic descriptions and chem. analyses are given of porphyrites, aplites, beresite and hematite-bearing quartz veins. Pyrite crystals occur in aplite and beresite, 11.5% in the latter. Reddish brown banded quartz veins traverse the porphyrites near Choysheva, contg.  $\text{SiO}_2$  83.60,  $\text{Fe}_2\text{O}_3$  16.10%.

E. F. H.

**Eruptive rocks, volcanic tuffs and breccias of Kara-Dagh in Crimea.** P. N. CHIRINSKI. *Bull. Inst. Politechn. Don* **5**, Sec. 2, 88-138 (1916); *Mineralog. Abstr.* **2**, 73.—Petrographic descriptions, and five analyses are given. The rocks include melaphyre, dacites, keratophyre, breccias, agglomerates, and tuffs. The tuffs are worked at 2 places as pozzolana. The setting qualities are perhaps due to zeolites and chlorites in this case, since feldspathoids are absent.

E. F. H.

**Report on rock specimens collected on Roald Amundsen's South Pole Expedition.** J. SCHETELIG. *Videns. Skrifi., I. Mat.-Naturv. Kl.* **1915**, No. 4, 32 pp.; *Mineralog. Abstr.* **2**, 77-8.—The rocks, collected in 1911-2, include granites (2 analyses), gneisses, and mica-schists from Mt. Betty in So. Victoria Land; granites (analysis), pegmatites, amphibolites (analysis), and gneisses from Scott's Nunataks in King Edward VII Land.

E. F. H.

**Rocks of Doormanstap in central New Guinea.** W. F. GISOLF. *Proc. Acad. Sci. Amsterdam* **26**, 191-8 (1923).—The rock consisted of magnetite with fresh olivine and a colorless lath-shaped mineral of moderate refringence and very weak birefringence. The results of a microscopic and optical study of thin sections are described. Chem. analysis by A. ter Braake and G. I. Wally of a sample freed as much as possible from magnetite gave:  $\text{SiO}_2$  40.46,  $\text{MgO}$  40.20,  $\text{Fe}_2\text{O}_3$  7.69,  $\text{Al}_2\text{O}_3$  4.12,  $\text{H}_2\text{O}$  (100%) 6.14,  $\text{H}_2\text{O}$

(200°) 1.60%. The alkalies could not be detd. The genesis of the rock is discussed.

L. W. RIGGS

The composition of the column of sedimentary rocks at Kiev. V. N. CHIRVINSKII. *Mém. Soc. Naturalistes Kiev* 26, 55-82(1917); *Mineralog. Abstr.* 2, 74.—An analysis is given of a mixture of rocks from a boring at Kiev. The amt. of each rock is proportional to its thickness in the boring.

E. F. H.

Microscopic and chemical investigation of several sedimentary rocks of the Cretaceous and Tertiary formations near Wolsk, Govt. Saratow. P. N. CHIRVINSKII. *Bull. Inst. Politechn. Don* 4, Sect. 2, 122-40(1915); *Mineralog. Abstr.* 2, 73-4.—Twenty analyses are given of cement-marls, glauconitic chalks, clays, sandstones, sands, and phosphorite nodules.

E. F. H.

Volcanic ashes and tuffs in Tertiary and Quaternary deposits of Caucasus and Cheleken Island. P. N. CHIRVINSKII. *Bull. regional Mus. Ind. Agric. Rostov on Don* 1919, pt. 1, 17-41; *Mineralog. Abstr.* 2, 72.—Six analyses are given of tuffs and ashes.

E. F. H.

Feldspathization of chalk from Kiev. V. N. CHIRVINSKII. *Geol. Messenger* 1916, No. 3, 132-3; *Mineralog. Abstr.* 2, 71.—Chalk from a boring at Kiev contained feldspar crystals. In the weathering of sedimentary rocks, K may be retained as secondary glauconite or feldspar, while Na is more readily leached out.

E. F. H.

The possible formation of natural graphite by the decomposition of carbides. H. DITZ. *Brennstoff-Chem.* 4, 132-4(1923).—The formation of graphite has taken place according to D. by the action of  $\text{CO}_2$  and CO on metallic carbides at high temps. and under pressure. In substantiating this statement various geologists are quoted.

C. T. WHITE

Geochemical laws of distribution of the elements. V. M. GOLDSCHMIDT. *Videnskaps. Skrift., Mat.-Natur. Kl.* 1923, No. 3, 17 pp.—The stages in the development of the earth are assumed to be: (1) originally a gaseous or fused mass; (2) by cooling 3 liquid-phases formed: metal, sulfide and silicate fusions, arranged in concentric shells by gravity, in the order given, silicate shell outermost; (3) the silicate shell sepd. by crystn. into lighter and heavier portions, distributed by gravity; (4) later rearrangements through the influence of gases and liquids. The present distribution of the elements was conditioned by their distribution quotient in the several phases. They may be classed as: (A) siderophile elements of the metal core, e. g., Fe, Ni, Co, Pt; (B) chalcophile elements of the sulfide shell, e. g., S, Se, Fe, Cu, Zn, As, Ag; (C) lithophile elements of the silicate shell, e. g., O, Si, Ti, F, Cl, Al, Na, K, Mg, Ca, Mn, W, Sn; (D) atmophile elements of the vapor envelope, e. g., H, N, He. The content of certain elements in shells A and B is estd. from the mean compn. of analogous parts of meteorites. The distribution of elements in the silicate shell is taken up in more detail. Residual chalcophile elements segregated as sulfide phases. Many of the rarer elements were taken up from fusion by isomorphous mixing with common rock minerals. In this way Fe and Mn were removed by olivine, Ti and Sc by Al silicates, Ba, Sr, Cs and Rb in the feldspars. The remaining rare elements crystd. out with the residual silicates in pegmatites; e. g., Li, Be, rare earths, Zr, Th, Ta, W, U, Sn, F, Cl, and  $\text{CO}_2$ ; with them are relict chalcophile elements.

E. F. H.

The laws of formation of the chemical elements in the universe. P. N. CHIRVINSKII. *Bull. Inst. Politechn. Don* 7, Sect. 2, 91-164(1919); *Mineralog. Abstr.* 2, 81-5.—"The elements by their association and progression in the rocks of the earth's crust and in meteorites present an analogy to the homologous series of org. compds. They had their origin in the different zones of a gaseous sphere; the heavier elements in deeper zones under greater pressure; and isomorphous and isotopic elements in the same zone. The av. chem. compn. of the igneous rocks of the earth's crust gives for the % no. of atoms: Si 20.5, metals 19.5, O 60.5, corresponding with the metasilicate formula  $\text{RSiO}_4$ . This is regarded as a pseudoelement *crustaerium* with at. wt. 20.56. Similarly for other zones the following progressive series (the last, *terrium* or primordial matter, representing the av. for the whole earth): *chondrium*,  $\text{R}_2\text{SiO}_4 + \text{RSiO}_4$ , at. wt. 24.36; *palladium*,  $\text{R}_2\text{SiO}_4 + 3\text{R}$ , 30.90; *siderium*, R, 55.72; *terrium*, —, 39.98."

E. F. H.

Matter on the spectroscopy of the earth's crust. II. Spectra of mica in oxygen-gas flame. V. I. VERNADSKII AND B. A. LINDENER. *Bull. Acad. Sci. Petrograd* [6] 9, 27-32(1915); *Mineralog. Abstr.* 2, 68.—The spectra of mica in an O-gas flame were examt. by a large quartz spectrometer, 77 micas being tested for Li, Na, K, Rb, Cs, Ti, In, Ga, Ca, Ba, Sr, Mn, Fe, Zn, Cu, Cr. In 66 Rb was detected, in 36 Cs, in 29 Ti. Rb is often strongly shown.

E. F. H.

The sub-continental temperatures (POOLE) 3. Measurement of the indices of re-

fraction of a solid by immersion in a liquid heated to a determined temperature (GAUBERT) 2. Crystallographic study of ammonium dimolybdo malate (DUFOUR) 2.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

**Progress in ore dressing and coal washing in 1922.** R. H. RICHARDS AND C. E. LOCKE. *Mineral Ind.* 31, 746-801(1922).—New developments and app. are described and discussed, and an extensive bibliography is given. A. B.

**Trend of metallurgical practice on the Witwatersrand.** A. W. ALLEN. *Eng. Mining J.-Press* 116, 58-61(1923).—The statement in the abstract in *C. A.* 17, 3010 that "Au recovery averaged 63.4%" should read "Au recovery averaged 63.4% by amalgamation and 36.6% by cyanidation." A. BUTIS

**Chromium.** ANON. *Mineral Ind.* 31, 98-105(1922).—A discussion of production and technology of chromite and Cr compds. and alloys. A. B.

**Cobalt.** C. W. DRURY. *Mineral Ind.* 31, 151-6(1922).—Production, metallurgy, and uses are treated, with bibliography. A. B.

**The metallurgy of copper in 1922.** L. S. AUSTIN. *Mineral Ind.* 31, 205-66(1922). A review. A. B.

**Copper.** W. H. WRED. *Mineral Ind.* 31, 157-205(1922).—Production and consumption, exports and imports, and prices are discussed, with statistics for the United States and foreign countries. A. B.

**Gold and Silver.** M. W. VON BERNEWITZ. *Mineral Ind.* 31, 269-346(1922). A review, including economics, world's production, markets, statistics, metallurgy, and milling. A. B.

**Iron and steel.** E. F. CONE. *Mineral Ind.* 31, 361-415(1922).—Discussion and statistics are given of the world's Fe and steel industry, including ore resources, technology, data on elec. steel, etc. A. B.

**Lead.** H. B. PULSIFER. *Mineral Ind.* 31, 416-41(1922).—Production, trade, markets, white lead and oxides are reviewed for the United States and the world. A. B.

**The metallurgy of lead in 1922.** R. G. HALL. *Mineral Ind.* 31, 441-50(1922).—A review. A. B.

**Manganese.** A. T. WARD. *Mineral Ind.* 31, 457-70(1922).—Production and trade, foreign sources and world's output are given. A. B.

**Molybdenum.** W. N. BRATTON. *Mineral Ind.* 31, 478-81(1922).—Figures for the world's production are given and the market is discussed. The use of Mo in steel is increasing rapidly. A. B.

**Nickel.** T. W. GIBSON. *Mineral Ind.* 31, 486-98(1922).—Metallurgy of Ni and the world's deposits are discussed and production statistics given. A. B.

**Platinum.** G. F. KUNZ. *Mineral Ind.* 31, 569-80(1922).—Production, prices, trade, consumption, etc., are given for Pt and allied metals. A. B.

**Quicksilver.** ANON. *Mineral Ind.* 31, 611-6(1922).—A review of the market and production. A. B.

**Quicksilver in 1922.** F. L. RANSOME AND ISABEL P. EVANS. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1922, Pt. I, 113-24(preprint No. 11, published Sept. 18, 1923). E. H.

**Tin.** E. B. SCOTT. *Mineral Ind.* 31, 667-86(1922).—A review of the world's production and consumption, mining conditions, and metallurgy. A. B.

**Tungsten.** C. G. FINK. *Mineral Ind.* 31, 698-710(1922).—The world's sources and output, trade, and metallurgy are reviewed. A. B.

**Zinc.** J. A. ZOOK. *Mineral Ind.* 31, 718-41(1922).—A review of production, market, trade, etc., including Zn dust and pigments, with statistics. A. B.

**Metallurgy of zinc.** W. R. INGALLS. *Mineral Ind.* 31, 742-5(1922).—New developments are reviewed. A. B.

**Blasting of zinc blocks.** G. HOFFKEN. *Z. ges. Schieß-Sprengstoffw.* 18, 76 (1923).—Masses of Zn weighing as much as 10 tons, formed by accidental leakage of a charge from a melting kettle, were broken up in the plant and recovered for remelting by the use of explosives. A number of "mud-capped" charges of 1-2½ kg. of "Silvit" were exploded simultaneously on the surface of the block. The mass was broken up at a cost of only 5% of the material value. C. G. STORM

**Treatment of oxidized copper ores.** P. W. NEVILL. *Chem Eng. Mining Rev.*

**15, 406-7(1923)** --Exptl. results are presented to show that the patented process owned by Copper Separation Ltd. gives metallic Cu directly from oxidized ores without the production of an intermediate sol. form of Cu, and that there is practically no consumption of acid or salts, with the formation of waste solns. W. C. BRAUGH

**Lime vs. limestone in basic open-hearth practice as affecting time costs.** L. M. FULLER. *Iron Steel Canada* 6, 180-1(1923).—A thermal discussion of the use of lime vs. limestone is given. By the use of lime instead of limestone, more Fe<sub>2</sub>O<sub>3</sub> is used and consequently more slag results, which causes a slower transfer of heat from the furnace into the metal as well as a loss of heat in the slag. In spite of this loss it is est'd. that a saving of 4% of all costs that are functions of time in favor of the CaO exists, in addition to the 50 cents previously shown (*C. A.* 17, 3153). W. A. MUELLER

**Results of experiments with various fuels at the blast furnace plant of the Bohler Bros. & Co., A.-G. in Vordernburg.** FRIEDRICH ZEYRINGER. *Stahl u. Eisen* 43, 1215-19(1923).—Expts. were conducted to find a more economical fuel than charcoal for the production of high-grade pig iron. Charcoal is desirable because of its purity as well as the rapidity of its combustion, which is advantageous from the point of view of the capacity of the furnace. The advantages and disadvantages of the combination of a fast burning and a slowly burning coke are discussed. If charcoal and coke be used, a forced air current introduced, then the unconsumed oxygen passing up through the charge would cause burning of the charcoal in the upper portions of the furnace or reducing area but possibly cause oxidizing conditions in the bosh. If the blast be lessened then two combustion zones are noted, one for each fuel, so that it is difficult to burn 2 fuels in the same furnace which have different combustion rates. From expts. on a number of diff. charcoals it is concluded that (a) the combustion increases with the area of fuel exposed to the air; (b) a fuel higher in ash burns more slowly than one lower in ash; (c) a porous or cellular fuel burns more rapidly than a more dense one; (d) the pressure of the blast rises as the size of the fuel diminishes. The relative time of burning of diff. sizes of the same fuel varies as the square of the size. The effect of the presence of a slowly burning coke in the bosh of the furnace is discussed and also the effect of this fuel on the C content of the pig iron made. Various fuels are discussed from these points of view. Fuels of diff. combustibility, when used together in the blast furnace give unsatisfactory results; this is further emphasized when the fuels are of uneven size. W. A. MUELLER

**Combustibility of blast-furnace coke.** R. A. SHERMAN AND S. P. KINNEY. *Iron Age* 111, 1839-42(1923); cf. *C. A.* 17, 1542.—The factors commonly believed to affect the combustibility of coke in air, namely character of coal, coking process, coking time, density, porosity, and volatile content, have no apparent material relation to the combustibility as measured in exptl. furnaces or in the blast furnace hearth. The only factor that has any appreciable effect on the combustibility is the size. LOUIS JORDAN

**Labor-saving blast-furnace equipment.** ANON. *Iron Age* 111, 1846-8(1923).—Mech. handling equipment at a blast furnace has reduced the no. of men per shift in the stock house from 19 to 3. Ore and stone bins discharge directly into elec. operated scale cars through segmental type gates operated from the scale car platform. Coke is discharged over cascade screens directly into skip cars while the coke breeze is collected and discharged directly into railroad cars. Direct control of skip cars, coke bin gates, coke breeze disposal equipment, furnace bells and furnace gaging mechanism is centralized at one point. LOUIS JORDAN

**Fluxes in cupola-furnace practice and a rapid method for testing limestone.** AULERT. *Gießerei-Ztg.* 10, 367-70(1923).—Chem. analysis is not necessary to det. the suitability of limestone for a flux. With HCl a satisfactory limestone effervesces violently and dissolves rapidly to a soln. which is wholly clear or only slightly turbid. Dark colored limestones give flakes or particles of C on soln. but these are not of consequence if no sandy ppt. appears. Limestones contg. clay, dolomite or SiO<sub>2</sub> dissolve much more slowly and pure dolomite only after several hrs. If a const. wt. of limestone is dissolved in a const. vol. of HCl (approx. 10 cc. per 2 g. of limestone) the relative times required for soln. together with the amt. and kind of residue furnish a means for estg. the relative values of limestones. By etching a limestone by HCl, the presence of quartz, dolomite, argillite, Fe pyrites, limonite and hematite can be detected by their insoln. Pure limestone after etching is smooth and glossy, whereas the impurities above appear in their characteristic form and color resp. as hard, white crystals, as dull white, easily crushed particles, as an impalpable slime insol. in HCl, as a pale yellow inclusion, as brown and as reddish loosely bound insol. particles. Dolomitic limestone has a dull, rough surface after etching and pure dolomite etches very slowly. The use of *fluorspar* as a flux is described. C. C. DAVIS

**The use of graphite in the foundry.** H. E. AXELRAD. *Glosserl Ztg.* **10**, 359-61 (1923).—A description of the occurrence and properties of natural graphite and the manuf. of different grades for foundry use. C. C. DAVIS

**The origin and testing of molding sand.** AVIICH. *Glosserl Ztg.* **10**, 356-9 (1923).—A description of the chem. and phys. properties of molding sand. The determinative properties in judging a sand are its refractory quality, permeability, porosity, plasticity and its solidity, for which standard tests are given. C. C. DAVIS

**Modern developments in foundry practice.** R. HARM. *Glosserl Ztg.* **10**, 353-6 (1923).—An illustrated description. C. C. DAVIS

**Present day tendencies in the metallurgy of iron and steel.** S. BRUILL. *Tech. nique moderne* **15**, 513-22 (1923). A. PAPINOT. *COUTURE*

**Chemistry in semi-steel.** J. E. BOCK. *Iron Age* **112**, 397-8 (1923). This article (hardly scientific) gives an outline of the duties of a foundry chemist. The analyses necessary in a foundry lab. are outlined. Some facts concerning the effect of C, Mn, S, P, and Si are stated. E. F. PERKINS

**Scientific investigation in the steel industry.** P. GOURENS. *Stahl u. Eisen* **43**, 1191-9 (1923). The Fe industry differs from most other chem. industries in that in the latter chem. processes are usually worked out and the reactions known before the process is placed on a com. footing. In the Fe and steel industry the process does not lend itself to lab. processes. A history is given of chem. control in the Fe industries and the effect of scientific investigation in this field is pointed out. Definite examples of benefits thus derived are mentioned in the operation of various furnaces, regenerators, processes and methods of heat treatment. W. A. MUELLER

**Dust and metal briquetting.** ANON. *Iron Age* **112**, 475 (1923). A description is given of a new method of briquetting fine dust and fine ores without use of moisture, heat or a binder. A steady pressure made equal on all sides of the briquet by a specially designed press eliminates all the air between the particles and binds them together. A pressure of about 154,000 lbs. per sq. in. is applied. E. F. PERKINS

**Marketing of slab zinc and zinc concentrate.** F. E. WORMSER. *Eng. Mining J. Press* **116**, 539-45 (1923).—Some specifications are included. E. J. C.

**Metallography.** HENRY LE CHATELIER. *Rev. trav. chim.* **42**, 846-9 (1923). A historical account of a new science arising from a new method of studying matter. An English student of agronomy created the science of petrography by making systematic microscopic studies of the mineral constituents of soils. In 1862 he published results on the microscopic appearances of meteorites and steels. Twenty five years later Osmund took up this neglected method for the systematic study of the constitution of steels. E. J. WITZEMANN

**X-ray examination of irregular metal objects.** A. SR. JOHN. *Trans. Am. Inst. Mining Met. Eng.* 1923, No. 1263-S, 11 pp.; *Iron Age* **112**, 467-9 (1923).—A new method for mounting objects for X-ray examm. is described. Specimens are placed in a liquid having nearly the same transparency to X-rays. Structural details can be seen in all parts of the most irregular objects. Typical defects observed in metals are illustrated and examples of the possibilities of the method are given. The method is rapid, inexpensive, and can be used on a com. scale. V. O. HOMBERG

**The relation between width of scratch and load on diamond in the scratch hardness test.** G. A. HANKINS. *Proc. Inst. Mech. Eng.* 1923, I, 423-87; cf. C. A. 17, 2858; Unwin, C. A. **14**, 725.—The square of the width of the scratch is a linear function of the load and for a given diamond under const. conditions the straight lines meet in a common point for all materials tested. If  $p$  and  $q$  are the coordinates of this point,  $P$  is the load,  $w$  the width of scratch and  $k$  a const. for each material, then  $P = p + (kw^2 - q)$ . It is suggested that  $k$  be a measure of the hardness of a material. Graphs of the ratio of this hardness to the Brinell hardness show that the ratio is a min. at 450 Brinell except for Cu. Some relation probably exists between this property of Cu and the fact that hard-rolled Cu gives a greater hardness than mild steel yet mild steel will always cut Cu and no cold rolling will make Cu cut steel (cf. Turner, *J. Iron Steel Inst.* 1909, No. 1). The shape of the diamond influences the results and to standardize the test a const. angle should be adopted. C. C. DAVIS

**Static indentation tests.** R. G. C. BATSON. *Proc. Inst. Mech. Eng.* 1923, I, 401-22.—See C. A. 17, 2858. C. C. DAVIS

**The hardness of metals as affected by temperature.** KIYOSU ITO. *Sci. Repts. Tohoku Imp. Univ.* **12**, 137-48 (1923). Brinell hardness has been detd., tabulated, and plotted for some 20 metals at different temps. lying between -50° and +150°. Conclusions: (1) Hardness increases with fall of temp. (2) The relation between hardness and temp. is given by the formula  $\log H_2 - \log H_1 = a(t_2 - t_1)$ , where  $a$  is the temp. coeff.

of the hardness. (3) There is a simple relation between the coeff. and the m. p. This relation resembles that of the temp. coeff. of Young's modulus or the torsion modulus to the m. p. (4) The hardness and its temp. coeff. are greater for rolled than for cast specimens of the same metal.

E. A. MEAD

**Magnetic indications of hardness and brittleness.** A. V. DE FOREST. *Trans. Am. Soc. Steel Treating* 4, 342-7 (1923).—Magnetic tests can be applied to raw material from which tools are made to det. its suitability of structure and phys. state. Bars unsuited for machining can be discarded or re-treated. Tests on the finished product can prove the acceptability of the tool or indicate what step is at fault in the heat treatment. Although not yet highly developed the method is very rapid and has great possibilities.

W. A. MUDGE

**Testing of steel for hardness.** H. M. GERMAN. *Trans. Am. Soc. Steel Treating* 4, 329-41 (1923).—A comparison of results obtained by different methods. W. A. M.

**The hardening of steel.** ZAY JEFFRIES AND R. S. ARCHER. *Trans. Am. Soc. Steel Treating* 4, 263-304 (1923).—Steel owes its hardness fundamentally to the abs. cohesion of the Fe atoms. The softening of hardened steels by tempering is due to the growth of Fe grains and of the Fe<sub>3</sub>C particles. Pure Fe and soft steels are relatively soft and weak, because of the presence of crystallographic planes of weakness or potential slip plains in the Fe or ferrite grains. The increased hardness and strength of pearlite as compared to pure Fe are due largely to the increased resistance to slip in the ferrite grains offered by the hard compnd. Fe<sub>3</sub>C. The increased hardness of sorbite and troostite as compared to pearlite, and of martensite as compared to troostite and sorbite, are due to a greater progressive refinement of the ferrite grains and the greater dispersion of the cementite particles. C in soln. or in atomic dispersion in ferrite makes the ferrite of martensite harder than the ferrite of pure Fe. Rapid cooling of austenite lowers its transformation temp. When this transformation is suppressed to about 300° or lower, the allotropic transformation of Fe occurs independently of the carbide formation. Freshly formed martensite is α-Fe in which the C is atomically dispersed; it is not as hard as martensite which has stood at room temp. for several days or has been given a mild heat treatment, because of the ppts. of Fe<sub>3</sub>C which "keys" the slip plains of the ferrite grains.

W. A. MUDGE

**The hardness of "common high" sheet brass.** A. L. DAVIS. *Trans. Am. Soc. Steel Treating* 4, 348-52 (1923).—A discussion of Brinell, Rockwell, Shore, Erichsen and Tensile tests as an indication of quality.

W. A. MUDGE

**Flake fracture and grain structure.** (Résumé of published work on the subject of grain structure in metals up to the year 1921.) FRANZ RAPATZ. *Stahl u. Eisen* 43, 1199-1202 (1923).—Various works and writings appearing during the current year are grouped together under their sep. headings and discussed. A bibliography of the subject is given in conclusion.

W. A. MUELLER

**The effect of quenching from above the carbide transition temperature upon the magnetism of steel.** A. A. DER. *Proc. Roy. Soc. (London)* 104A, 316-21 (1923).—No evidence was found of any suppression of the magnetic transformation of the carbide resulting from sudden cooling from above the transition temp. when the following expts. were carried out: (1) the detn. of the initial part of the magnetization curve of a rod of annealed carbon steel (1.1% C) after it had been cooled slowly, and after it had been quenched from 300° in ice-cold H<sub>2</sub>O; (2) a comparison of the residual magnetism of the same rod as the temp. was raised up to about 260° after an initial slow cooling and again after quenching from 300°; (3) a comparison of the magnetization of the rod in a const. field while cooling slowly and while cooling rapidly; and (4) the detn. of the permeability of a carbon steel ring after slow cooling and after quenching. Though a sharp bend in the curves at about 210° was found in expts. (2) and (3), showing that a transition was taking place, there was no marked difference between the curves of the slowly cooled and of the quenched rod.

C. C. VAN VOORHIS

**Magnetization and molecular deformation of steel under strain.** Elastic limit. L. FRAICHT. *Rev. métal.* 20, 32-45 (1923).—The variations in magnetic flux of a steel bar placed in a magnetic field of const. intensity and simultaneously subjected to a tensile strain were studied. The test bar in the testing machine was surrounded by a primary magnetizing coil and by a secondary coil connected to a sensitive galvanometer for observing changes in the magnetic flux, connections being made so that increase in flux always threw the galvanometer spot in the same direction. The mathematical principles of the problem are discussed at some length, and several magnetic diagrams (obtained photographically) are given. F. concludes from his results that only the elastic deformations cause variations in the intensity of magnetization; and that the permanent deformations, by decreasing the cross section of the bar, cause a decrease

in the magnetic flux, which variation is practically a linear function. (Cf. following abstract.)

A. PAPINEAU-COUTURE

**Magnetic test of steels under tensile strain.** Elastic limits. L. FRACHIER. *Rev. métal.* 20, 549-59(1923).—The app. used (previous abstract) is described in more detail. The results of a large no. of tests made with differently treated grades of steel are given in detail together with the magnetic diagrams. F. concludes that: (1) With a given app. and a given magnetizing force a given type of steel always gives exactly the same magnetic diagram, which can thus serve to identify it as regards both compon. and thermal treatment. (2) The magnetic diagram gives all the information given by the tensile-strength diagram, but more clearly than the latter. (3) It shows a permanent molecular deformation at relatively small load, which depends on the nature and treatment of the metal. This load is called the "true elastic limit." These deformations do not necessarily cause a permanent elongation and are not necessarily detected by even the most accurate linear measurements. (4) Owing to the close relationship between magnetic and hardening phenomena, the magnetic diagram can give valuable indications concerning the latter.

A. PAPINEAU-COUTURE

**A study of the  $A_1$  and  $A_3$  transformations in carbon steels by means of a differential dilatometer.** S. KONNO. *Sci. Repts. Tohoku Imp. Univ.* 12, 127-36(1923).—A dilatometer similar to the one used by P. Chevenard is described. With it, the positions of  $A_1$  and  $A_3$  as well as the solv. limit of cementite in hypoeutectoid steels have been detd. Dilatation-temp. curves for several hypoeutectoid and hypereutectoid steels are shown. From the curves obtained, K. interprets the net dilatation at  $A_{1\text{f}}$  and  $A_{3\text{f}}$  points as the algebraic sum of the dilatations due to the constitutional changes which occur at these points.

E. A. MEAD

**Effect of silicon on equilibrium diagram of system carbon-iron near eutectoid points.** H. A. SCHWARTZ, H. R. PAYNE and A. F. GORROD. *Trans. Am. Inst. Mining Met. Eng.* 1923, No. 1261-S, 6 pp.—The changes in compon. and temp. of the stable eutectoid point with increasing Si have been recorded. The values do not approach the probable  $A_3$  metastable point when the Si content is such as to reduce the C concn. to nil. Microscopic evidence that  $A_{1\text{f}}$  stable lies below  $A_{3\text{f}}$  metastable in a normal white cast Fe is also presented. The results of previous expts. as to the effect of Si on the metastable  $A_1$  were confirmed and deductions made regarding the possible eutectoid C content.

E. A. MEAD

**The effect of heat treatment on lathe tool performance and some other properties of high-speed steels.** H. J. FRECH, JEROME STRAUSS and T. G. DIGGES. *Trans. Am. Soc. Steel Treating* 4, 353-96(1923); cf. C. A. 16, 3817. New and important data show the time-temp. relation in the hardening and tempering of high-speed steel and their effects upon lathe tool performance, constitutional and dimensional changes. Comparisons of endurance at various cutting speeds of the 4 most important of the current steel types for roughing tools are given and the relative advantages and disadvantages of each discussed. The "Taylor" and "breakdown" tests for lathe tools are compared and some of the merits of the former are discussed in detail. Consideration is also given to the performance and elimination of "flaky fractures" in the heat treatment of high-speed steels.

W. A. MUDGE

**Destruction of the primary structure in technical steels.** P. OBERHOFER and A. HEGER. *Stahl u. Eisen* 43, 1151-5(1923).—Pieces of steel of varying compon. were treated in a Heraeus platinum foil type furnace, 60 mm. diam. and 400 mm. long in a neutral atm. of N<sub>2</sub>. At temps. of 1200-1300° during periods of long treatment the samples showed losses in C and a gain in N. Attempts were made to remedy this defect but were only partly successful. Between temps. of 1100° and 1300° the changes taking place are in proportion to the time of exposure to treatment. The changes also vary with the change and type of crystn.

W. A. MUELLER

**Various experiments on drawn steel wire with high resistance.** J. SEIGLE. *Rev. ind. minérale* 1923, 105-10.—Results are given of tests of cables submitted to simple traction, torsion, rolling and unrolling without load, etc.

C. C. DAVIS

**New experiments on soft steel bars broken by traction.** J. SEIGLE. *Rev. ind. minérale* 1923, 71-4.—Steel bars previously broken by traction, which were submitted to repeated transverse blows while under a tension 65-70% of the breaking load, showed enormous deformation compared with the deformation under similar conditions of wire not previously under traction.

C. C. DAVIS

**High-grade low-carbon cast iron (semi-steel).** F. WÜST and P. BARDENHEWER. *Mitt. K. W. Inst. Eisenforschung* 4, 125(1922); *Gieserrei-Ztg.* 10, 320-4.—A review and description, with tabulated data, of the influence of C (different forms), Si, Mn, P and S on the strength of cast-Fe. The essential property of a high-grade cast Fe is a fine state

of division of the graphite distributed in the purest possible form of pearlite. This structure is attained with a low content of C and Si and high Mn. C. C. DAVIS

**Some commercial alloys of iron, chromium, and carbon in the higher chromium ranges.** C. E. MACQUIGG. *Trans. Am. Inst. Mining Met. Eng.* 1923, No. 1265-S, 17 pp.—The paper discusses the development and some of the properties of alloys of Fe, Cr, and C in ranges of Cr much higher than formerly have been commercialized. While chiefly developed for oxidation resistance, these alloys have other valuable properties, e. g., resistance to acid mine waters, forgeability, hardness, etc. Photomicrographs of typical alloy structures are shown and discussed; also data are given to show the amenability of the alloys to heat treatment. E. A. MEAD

**Invar and related nickel steels.** ANON. *Bur. Standards Circ.* No. 58, 93 pp. (1923).—This circular is mainly a compilation of data obtained during the last 30 years by various investigators on the different properties of Ni steels. Particular attention is given to "Invar," a Ni-Fe alloy contg. about 36% Ni and possessing an extremely small thermal expansivity at ordinary temps. The nature of the anomalies in behavior met with in these steels and characterized by the irreversible and reversible phenomena is discussed in the light of the results obtained on their various phys. properties. In particular, the anomalous behavior in the thermal expansivity of different Ni-Fe alloys at various temps. is illustrated by a number of diagrams, and the rule of corresponding states formulated by Guillaume has been applied in interpreting some of the results. The theories advanced as an explanation for this anomalous behavior are briefly dealt with. The anomalies in the elastic modulus of Ni steels, of practical importance in the horological industry, and also the constancy in dimensions of invar are discussed. Attention is called to "Elinvar," a recently introduced Ni steel contg. 36% Ni and 12% Cr, or its equiv., and possessing an invariable modulus of elasticity over a large temp. range as well as a low thermal expansivity. A list of manufacturers of Ni steels and dealers in Ni steels of min. thermal expansivity and a selected bibliography are appended. E. A. MEAD

**Some effects of zirconium in steel.** A. L. FEILD. *Trans. Am. Inst. Mining Met. Eng.* No. 1266-S, 30 pp. (1923).—Following a description of methods of exptl. steel manuf. and lab. testing, the preferential chem. reaction of Zr with O, N, and S in steel is discussed in the light of typical analyses. By means of a tentative working theory, the various effects of Zr on the mech. properties of steel are explained, including its effect upon endurance limit, yield point, impact resistance, "red-shortness," sonims, and on the ductility of heat-treated steels. Plain carbon steels only are considered in this paper. E. A. MEAD

**Iron-arsenic alloys.** P. OBERHOFFER AND A. GALLASCHIK. *Stahl u. Eisen* 43, 398-400 (1923).—The principal object of the investigation was to establish the constitutional diagram from 0 to 8% As, the region 8.4-56% As having been previously studied by Friedrichs (*Metallurgie* 1907, 131). The  $\delta$ - $\gamma$  change (cf. Ruer and Klepper, *C. A.* 8, 3177) is shown. The portion of the diagram dealing with solidification is of the iron-C type. The max. solv. of As in  $\delta$ -iron is 0.9% and in  $\gamma$ -iron 6.8%. Pure iron melts at 1528°. The change point of the  $\delta$ -mixed crystals with liquid to  $\gamma$ -mixed crystals is 1440°. No decomprn. of  $\gamma$ -mixed crystals was found from 0 to 7% As. The magnetic change point on cooling was depressed 80° by 0.5% As, and then remained const. The change point on heating was not affected. Above 3% As no change point could be detected. Micro-examn. was in agreement with thermal data, and showed homogeneous mixed crystals up to 6.67% As. Alloys richer in As colored more quickly on etching and showed a striped appearance. The alloy with 7.29% As contained traces of eutectic. The eutectic point is at 30.3% As, above which a new constituent, X, appeared embedded in eutectic. J. S. C. I.

**Protective coatings for selective carburization.** J. S. VANICK AND H. K. HERSCHEMAN. *Trans. Am. Soc. Steel Treating* 4, 305-28 (1923).—A comparison of Cu plating, fireclay, kaolin and enamel mixts. as an effective protection of steel surfaces for carburization. Cu plate is very effective but subject to defects inherent in electrodeposits; these defects are most readily overcome by increasing the thickness of the coating; these data are given in curves and tables. A thin coating of enamel and a thick coating of fireclay-water glass paste give moderately satisfactory protection; the enamel may be more easily applied and gives better results. The infiltration of nitrogenous gases through the protective coating caused contamination by N<sub>2</sub>; the decomprn. of a nitrate gave similar results with the enamel mixt. W. A. MUDGE

**Recommended specifications for pig iron.** RICHARD MOLDENKE AND WALTER WOOD. *Foundry* 51, 776(1923). Revised specifications of the Am. Soc. for Testing Materials.

E. J. C.

**Some uses and properties of wrought iron.** S. J. ASTbury. *Proc. Inst. Mech. Eng.* 1923, I, 511-6.—Attention is drawn to properties of wrought Fe indicating that its usefulness might be greatly expanded.

C. C. DAVIS

**The crystal structure of various Heusler alloys by use of X-rays.** J. F. T. YOUNG. *Phil. Mag.* 46, 291-305(1923).—The cryst. structures of Al, Cu and Mn have been studied by X-ray methods. Al and Cu crystallize in a face centered cube of lattice const. 4.05 and 3.60 Å U. resp. The structure of Mn was not solved. Two Heusler alloys (Al 15.9, Mn 23.9, Cu 60.3% and Al 14.3, Mn 28.6, Cu 57.1%) occur in two cryst. forms - a face-centered cube of 3.70 Å, and a combination of this and a body centered cube of 2.98 Å. The cryst. habits of Heusler alloys are discussed in relation to the theories of alloys; evidence is tentatively adduced that they may be considered as solid solns. of Mn-Al alloy in Cu. In no case was there evidence of free constituent metals in the alloy. In agreement with other ferromagnetic data, the more ferromagnetic Heusler alloy contained a body-centered cubic lattice while the more weakly magnetic showed only the face-centered cubic lattice. Variation of magnetic properties by heat treatment produced no apparent change in cryst. form. Field of 3500 gauss did not alter the cryst. form. Arguments are presented that the *ultimate magnetic unit* is not the mol. or atom but is associated with the valence electrons.

S. C. LIND

**Thermoelectric behavior of copper-nickel and copper-gold alloys obtained by diffusion in the solid state.** L. ROLLA, L. MAZZA AND P. F. GAROGLO. *Met. italiana* 15, 197-217(1923).—The expts. were performed upon coppered Ni wires, coppered Ni ribbons, nickelized Cu wires and coppered Au wires. Details of the method of prepn. and study of these and the measurement of the e. m. f. for varying periods of time are given. The cold junction was held at 0°, the hot junction at 100°. Within the time limits the alloys by diffusion became homogeneous, this fact being verified also by photomicrographic study (photomicrographs given). The range of alloys covered varying concns. of the different constituent metals. The initial e. m. f. depends (a) upon the nature of the metals present, (b) upon the concn. of the components. In such systems as were studied in these expts., if the inner foundation and the outer layer are homogeneous and present const. sections at every point, then the e. m. f. is independent of the distance between the hot and cold junctions. The authors worked out a formula for calcg. the e. m. f. of the different systems. They obtained by means of it figures showing close agreement with the found values.

ROBERT S. POSMONTIER

**The electrolytic separation of metallic alloys.** I. A. H. W. ATEN. *Rec. trav. chim.* 42, 750-5(1923).—In a previous paper (*C. A.* 17, 3632) A. considered the current-tension curves relating to the sepn. of a single metal. In the same way the sepn. of an alloy of 2 metals may be considered. This paper is a mathematical discussion of the case of an alloy composed of a conglomerate of 2 metals contg. neither mixed crystals nor compds.

E. J. WITZEMANN

**Effect of heat treatment on release of stress in bronze castings.** R. J. ANDERSON AND C. H. ELDRIDGE. *Trans. Am. Inst. Mining Met. Eng.* 1923, No. 1259-N, 13 pp.—Results are given of some expts. carried out in the Bur. of Mines in studying the effect of heat treatment on the release of internal stresses in bronze castings. All castings are internally stressed owing to contraction in vol. on freezing and cooling, and internal stresses can be removed by appropriate annealing. Heat treatment expts. on cast bronze rings of the nominal compn. 87: 7: 5: 1 Cu-Sn-Zn-Pb showed that heating for 1 hr. at 550° was sufficient for the removal of internal stresses up to 11,299 lb. per sq. in. This heat treatment has been applied to com. castings with satisfactory results.

V. O. HOMERBERG

**The testing of castings.** RUDELOFF. *Gieserai-Ztg.* 10, 375-8(1923).—A review and discussion of the properties of castings, the factors influencing these properties during casting, and recognized methods for testing the quality.

C. C. DAVIS

**The principles of lead coating.** HEINZ BABLICK. *Stahl u. Eisen* 43, 1155-6 (1923).

W. A. MUELLER

**Electrolytic protection of condenser tubes.** A. B. *Technique moderne* 15, 567-8 (1923).—A discussion of the causes and mechanism of corrosion of marine engine condensers and of its prevention or retardation by passing a current of 2-3 amp. per 100 m.<sup>2</sup> (and up to 10-100 amp. for a short time). For new condenser tubes and corrosive water, it is advisable to use a high amperage for a few days, until there is formed a thin

film of  $\text{CaCO}_3$  (of the order of a few tenths of a mm.), and then reduce it to about 3 amp.

A. PAPINEAU-COUTURE

**The rapid corrosion of condenser tubes.** GUY D. BENGOUGH. *Engineer* 136, 7-10 (1923).—The corrosion of condenser tubes due to the presence of entangled air in the circulating water was investigated. The cause is independent of the chem. compn. of the tube. Sea water as employed for condensing always contains a small amt. of air in small bubbles. Corrosion by such water is more rapid when the entangled air is in a fine state of subdivision. The most probable explanation is of a phys. nature. The corroded surface is remarkably free from corrosion product. Apparently a protective scale is penetrated and removed by the air bubbles.  $\text{H}_2\text{S}$  in condensing water is harmful.

D. B. DILL

Studies on double decompositions between metals and metal oxides and carbon (NisCnK) 6. Nitrogen fixation (U. S. pat. 1,466,625) 18. Ammonia, soda and carbon acids as blast-furnace by-products (U. S. pat. 1,466,628) 18. Reducing cyanide in a blast furnace (U. S. pat. 1,466,626) 18.

**Separating ores.** PLAUSON's (Parent Co.), Ltd. Brit. 196,944, Oct. 28, 1921. The ingredients of ores of metal value are sepd. by mechanically colloidizing one ingredient and by leaving the other substantially unaffected by high-speed mech. disintegration, e. g., in a colloid mill as described in 155,836, in the presence of a dispersator, possessing an elec. charge of the same sign and preferably of the same magnitude as the charge on the particles of the ingredient to be colloidized. In an example zirconia earths are treated in a colloid mill with water glass and caustic alkali. The colloidal soln. of  $\text{ZrO}_2$  may be decanted from the impurities and may be centrifuged, ultra-filtered or subjected to electro-endosmosis to obtain the pure oxide. Sulfite-cellulose liquor and free alkali may be used as dispersator and Ag, Cu, Su, and Hg ores may be similarly treated. A further example shows the colloidization of Mn compds. from a Cr-Mn ore with cherry gum and alkali as dispersator. Other examples are given.

**Chloridizing ores.** J. H. HIRT. U. S. 1,467,037, Sept. 4. Ore, e. g., non-sulfide Au, Ag and Cu ore, is fed to a chloridizing zone at such a rate as to insure the presence of a cooler overlying body of ore over the ore in the reaction zone while the latter is treated with a volatile chloride such as  $\text{NaCl}$ ,  $\text{MgCl}_2$  or  $\text{FeCl}_3$ . The material is protected from atm. oxidation and escape of volatile metal chlorides is prevented by condensing them in the overlying relatively cool body of ore. Cf. C. A. 16, 1387.

**Chloridizing volatilization ore treatment.** H. R. LAYNG. U. S. 1,465,138, Aug. 14. Ore is ground in a chloridizing soln., surplus soln. is sepd. and values are ppt. from it and the ore residue is then heated sufficiently to volatilize its remaining values. The process is adapted for treating oxidized Pb-As ores.

**Treating zirconium ores.** J. KOERNER. U. S. 1,467,275, Sept. 4. Ores such as those of Zr, Ti and Ce are fused with Na silicofluoride to obtain a product sol. in  $\text{H}_2\text{SO}_4$ .

**Concentrating oxidized ores.** N. C. CHRISTENSEN. U. S. 1,467,354, Sept. 11. Natural oxidized ores, e. g., ores contg. Cu, Pb or Mn (which are unaltered except by grinding) are formed into an aq. pulp free from electrolytes which inhibit selective formation of oil-mineral flocs contg. non-siliceous minerals, treated with a flotation mixt. contg. fixed animal or vegetable oils and then subjected to flotation sepn.

**Leaching complex ores.** U. C. TAINTON. U. S. 1,467,516, Sept. 11. Roasted ore, e. g., ore contg. Fe, Zn and Cu, is divided into 2 portions, one contg. compds. such as Cu and Zn ferrates which are difficultly sol. and the other contg. easily sol. compds. The difficultly sol. compds. are subjected to the leaching action of a strong acid soln. and the easily sol. material is then leached with acid soln. after its strength has been reduced.

**Reducing ores.** SOC. ANON. J. COCKERILL. Brit. 197,903, Oct. 20, 1922. Oxidized ores of Fe or other metals are treated for the production of the metal by intimately mixing them with a reducing agent and heating the mixt. to a temp. short of fusion by means of a neutral flame in a neutral atm. The intimate mixt. of the ore and the reducing agent, which may be coal dust, coke, sawdust or the like, is preferably effected by briquetting under pressure. The furnace used is heated by gaseous, liquid, or powd. fuel, and the air supply is regulated to produce the neutral atm. When the material treated has attained the temp. of reduction, the furnace flame is stopped, and the reaction and cooling are completed in the neutral atm. Volatile impurities such as As are eliminated during the treatment.

**Smelting manganese carbonate ores.** B. G. KLUGH. U. S. 1,467,797, Sept. 11. Smelting of Mn carbonate ore is facilitated by mixing the crushed ore with coking ma-

terial such as pitch and coking coal and heating the mixt. to low redness simultaneously to evolve CO<sub>2</sub> and volatile constituents of the added coking material.

**Recovery of flotation oils.** Soc. DE RECHERCHES ET DE PERFECTIONNEMENTS INDUSTRIELS AND E. B. G. BASCOU. Brit. 188,340, April 14, 1923. Oil is recovered by pressure instead of by distn. from the butter-like mass produced when coal, lignite, ores, etc., are purified by the Trent or other flotation of flocculating process. The mass may be heated before, during or after the compression. In a particular case coal passing a sieve of 200 meshes per sq. cm. was agitated with H<sub>2</sub>O and petroleum or fuel oil. The sepd. "butter" was compressed at 100° in filter presses used for making lignite blocks or bricks. Under a pressure of 1 ton per sq. cm. 78% of the oil was recovered, under 1.7 tons 91%. While only a portion of the oil is pressed out the residue acts as a binder, and the coal and lignite blocks may be used directly with the addn. of tar, etc.

**Apparatus for mixing ore pulps for flotation.** H. C. COLBURN and E. A. COLBURN. U. S. 1,468,226, Sept. 18.

**Briquetting.** ANDREWS Co., LTD. AND A. M. DUCKHAM. Brit. 197,433, Feb. 18, 1922. In briquetting ore or fuel with waste sulfite liquor the formed briquets are preferably dried and warmed and are then immersed, e. g., for 5 min., in a bath of molten metal, such as Pb, maintained at 425° to 475°. App. is described. CL 13,375, 1915 (C. A. 11, 529).

**Rabble apparatus for McDougall type of ore-roasting furnaces.** L. B. SKINNER. U. S. 1,468,216, Sept. 18. Teeth having hollow hubs are assembled end to end on a webbed support to form a hollow rabble arm, anteriorly divided into cooling passages.

**Crucible furnace for treating ores.** J. T. LENEGRE. U. S. 1,467,179, Sept. 4. The furnace is adapted for reducing metals from ores.

**Ore-roasting furnace.** R. D. PIKE. U. S. 1,466,382, Aug. 28. The furnace is adapted for calcining calcite or magnesite.

**Open-hearth regenerative furnace.** C. C. BUMBAUGH. U. S. 1,467,827, Sept. 11. The furnace has a tilting body mounted upon regenerators.

**Blast furnace.** W. L. KLUTZ. U. S. 1,465,273, Aug. 21.

**Tin sponge.** E. KARDOS. U. S. 1,466,837, Sept. 4. Sn sponge is coated with ZnCl<sub>2</sub> to protect it from oxidation.

**Refining tin.** T. GOLDSCHMIDT AKT.-GES. AND W. LÖTY. Brit. 196,938, April 30, 1923. Impurities, such as As, Sb and Cu, are removed in a scum produced by adding to a bath of molten Sn an element, such as Na, Ca, Zn or Al, and then bringing the bath into contact with an O-contg. substance, such as air or water. The elements may be added in instalments and the scum removed after each addn., or the elements may be added separately or together such as in the form of an alloy. The scum obtained in one refining operation may be used for the treatment of further quantities of Sn and when the absorptive capacity of the scum is sufficiently reduced any Sn present may be sepd. by a liquation process, and the elements recovered in any known way.

**Apparatus for melting and refining lead or other metals.** H. HARRIS. U. S. 1,465,128, Aug. 14. The app. comprises a melting pot for the metal to be refined and a framework arranged to be lowered to rest on the melting pot and carrying a container for molten NaCl and NaOH or other refining reagent into which the metal may be delivered from the melting pot by a pump.

**Cast metal plates for safes or vaults.** M. L. HARTMANN. U. S. 1,468,362, Sept. 18. Fragments of chromite are embedded in plates of Fe or steel or other cast metal, to render them more resistant to high-temp. flames.

**Binder for molding sand.** H. H. HURT. U. S. 1,467,321, Sept. 11. Ammoniated concd. sulfite liquor freed from at least most of its mineral bases and emulsified with a small proportion of petroleum oil when baked with sand changes into a condition giving no color with H<sub>2</sub>O.

**Corrosion- and heat-resisting apparatus of composite metal construction.** P. A. E. ARMSTRONG. U. S. 1,467,563, Sept. 11. Devices such as containers for Pb baths are formed of a layer of mild steel or other material resistant to heat and corrosion and another layer of cast metal, e. g., "silcerome."

**Heat-treating manganese-steel castings.** S. APGAR and G. R. HANKS. U. S. 1,466,636, Aug. 28. Mn-steel castings of large and intricate form are blanketed as soon as the casting can be handled without bending and while protected introduced into a furnace previously heated to an annealing temp. The furnace is sealed and brought to an even temp. which is slowly reduced. After a time the blanket is removed from the casting and the latter is reheated to the usual temp. for treatment of Mn steel and then quenched in H<sub>2</sub>O. The preliminary treatment specified serves to avoid dangerous shrinkage stresses.

**Heat-treating manganese-steel castings.** J. H. HALL and M. F. APGAR. U. S. 1,466,649, Aug. 28. Large Mn-steel castings of intricate shape are preliminarily annealed by placing them, while still at red heat after casting, in a furnace having about the same temp. as the casting. The temp. is gradually raised to about 760° and this temp. is maintained for a time (depending on the size and nature of the casting) sufficient to insure uniform temp. changes throughout the casting.

**Molds for making smooth metal castings.** T. D. LUCIER. U. S. 1,467,112, Sept. 4. Molds are formed from a mixt. of graphite and coal tar or pitch, the binder is carbonized without permitting distortion of the mold and the carbonized tar or pitch is then converted into graphite.

**Manganese-steel pipe balls.** J. H. HALL. U. S. 1,467,542, Sept. 11. Balls are cast from Mn steel poured at a temp. close to its freezing point, the balls are charged into a hot furnace and heated to about 1060° and are then quenched to obtain a uniformly fine-grained metal.

**Furnace for preheating metal castings, etc.** R. W. WIEDERWAX. U. S. 1,465,797, Aug. 21.

**Coating metals.** E. E. SCHUMACHER. U. S. 1,467,398, Sept. 11. A core of base metal, e. g., an electrode of Fe, W, Mo, Cr or Ta, is dipped into a molten bath of Ba(OH)<sub>2</sub> to form a thermionic coating.

**Brazing metals.** P. BUCKLEY and BUCKLEY, SAUNDERS, & CO., LTD. Brit. 194,144, March 13, 1922. In a method of uniting 2 metal bodies, they are placed in a reducing atm. such as H or CO, with a metal of lower fusing point near the joint, the metal being melted so that it flows into the joint by passing an elec. current through the bodies. A suitable construction is specified.

**Coating surfaces.** BRITISH METAL SPRAY CO., LTD., AND W. M. GILLESPIE. Brit. 196,693, Jan. 27, 1922. A method of providing objects with a protective coating of any required thickness and of high resistance to abrasive or other action consists in spraying the object to provide it with a preliminary coating of a more or less porous deposit of metal, such as Zn or Pb, or enamel and thereupon applying by any suitable means a protective prepn., such as metal, enamel, glass or glue, in such a way that a solid body is formed within the pores or between the particles of the preliminary coating, to which compd. coating subsequent layers of the protective prepn. will adhere firmly. The pores of the preliminary coating may be opened prior to the deposition of the protective prepn. by means of heat or sand blast. The final surface of the protective coating may be sprayed with metal or enamel or the like, or where the protective prepn. is such that metal or enamel will not adhere thereto, any other final covering coat may be applied.

**Coating aluminium.** ALUMINUM CO. OF AMERICA. Brit. 197,306, March 3, 1923. An oxide coating is produced on Al or Al alloys by treatment with NH<sub>4</sub> soln., preferably nearly at b. p., the soln. contg., e. g., 1 vol. of concd. aqua NH<sub>3</sub> to 9 of H<sub>2</sub>O. Alloys with Ni, W, Ag, Fe, Zn and Cu, in specified proportions, and with other metals and Si in unspecified proportions are referred to as producing a wide range of characteristic colorings, or specified amts. of salts of such metals as will produce the desired color are dissolved in the bath. The coating on pure Al may be darkened by hanging a metallic plate, e. g., of Ag or Ni, in the bath, Ag, in the former case, being deposited on the Al. The coating is electrically insulating and serves as a basis for painting or electrodeposition. Cf. C. A. 17, 3477.

**Annealing aluminium.** R. E. TALLEY. U. S. 1,466,257, Aug. 28. Al is annealed by passing it through an elec. furnace at a regulated speed.

**Vehicle wheels.** BAUSH MACHINE TOOL CO. Brit. 195,893-4, June 7, 1922. A vehicle wheel is made of an Al alloy consisting of 94% of Al, 0.5% of Mg, and Cr, Mn and Cu in varying proportions. The alloy is cast into ingots, forged to the required shape, heated to 500-525°, quenched, and then allowed to age for a period of 1 to 5 days. The machining may be done before the aging is complete.

**Machining metal.** F. KRUPP AKT.-GESELLSCHAFT. Brit. 196,582, Feb. 22, 1923. Metal such as Mn steel commonly machined by grinding is turned, planed, milled, or drilled, etc., while heated to a temp. below a red heat. High-speed steel tools or tools made of the alloy known under the trade mark Stellite are employed.

**Iron and steel manufacture; alloys.** T. MIYAGUCHI. Brit. 195,677, Nov. 3, 1921. In the manuf. of Fe and steel from Fe ores, pig iron, scrap iron or steel, the raw material is melted in an electric or crucible furnace and a certain amt. of slag added. A suitable oxidizing agent such as Fe<sub>2</sub>O<sub>3</sub> is added to remove the Si, etc., the slag being replaced several times and then boron or ferro-boron is added, the molten material being covered by a new slag; C to produce the steel desired is then added. W, Mo, Cr, Co, Ni-Ti or V, singly or a mixt. of two or more may be added to the charge. Instead of

boron or ferro-boron, compds. of  $\text{BoO}$  such as a borate mixed with C may be added, and if Fe ore is treated it is reduced with C before treatment.

**Re-crystallizing steel after testing.** K. DAEVES and R. WEISSENBERG. Brit. 197,330, May 1, 1923. Fe and steel structures, particularly those with welded joints, are subjected to heat treatment after testing to eliminate the effects of any strain due to overloading. Steam boilers, pulleys, wheels, gearing, and parts of bridges and buildings are mentioned. The temp. range varies from 730° to 900°.

**Iron smelting.** R. FRANCHOT and K. P. McELROY. U. S. 1,466,614, Aug. 28. In operation of a blast furnace for producing Fe or Fe alloys, lot of reducing gases are diverted from the lower portion of the shaft in sufficient quantity to cause a deposition of C from the gases in the shaft in excess of the C which is there gasified, and thereby supply C for return to the hearth.

**Protecting iron and steel from corrosion.** P. E. KEEN. U. S. 1,467,171, Sept. 3. A protective coating comprising a heavy cryst. body portion and an overlying smooth coating is formed on Fe or steel articles by successive heatings in a furnace muffle with hydrocarbon vapor and superheated steam.

**Deoxidizing and carburizing the surface of iron or steel.** J. T. JONES. U. S. 1,466,301, Aug. 28. Molten pig Fe contg. combined C is used for treating Fe or steel, e. g., tool or armor plate steel, to effect deoxidation and carburization.

**Alloys.** R. WILD and A. H. WILD. Brit. 197,733, Feb. 17, 1922. In the production of alloys contg. Fe and Cr, such as ferro chrome or unstainable Fe or steel, of the type in which molten alloys contg. oxidizable impurities is subjected to an oxidizing blow, the blow is performed in the presence of an element, such as Mn, which is more readily oxidizable than Fe, for the purpose of reducing the loss of Cr during the blow. With alloys of the type of unstainable Fe or steel, the proportion of Mn is not less than about 2%, or not less than about  $\frac{2}{3}$  of the oxidizable impurities; with ferro chrome, the proportion of Mn may be lower. The Mn may be introduced during the manuf. of the crude alloy by effecting the reduction in the presence of Mn or of a reducible compd. thereof, or by using silico-Mn as the reducing agent; or the Mn may be added, e. g., as ferro-Mn, to the already prep'd. alloy. The reduction of the Cr compd. may be effected in a molten bath of C-free or low-C Fe or steel, or ferro chrome may be added to the molten Fe or steel, the product in either case being blown under the above described conditions; or ferro chrome blown under these conditions may be added to Fe or steel. The reduction mixt. may be used in the form of briquets. The blast may be delivered to the metal through a wrought-iron pipe covered with fireclay, and it may carry in reagents such as chromite, or lime.

**Alloys.** R. WILD and A. H. WILD. Brit. 198,423, March 1, 1922. In the production of ferro alloys, particularly iron-Cr alloys, such as ferro chrome or unstainable iron or steel, of the type in which compds. of one or more of the metals are reduced by means of Si, the reduction is effected in the presence of an excess of the reducible compds. over the quantity chemically equiv. to the reducing agent. The reducing agent may be ferro-Si, and the reduction may be effected in the presence of lime or other slag forming material. A charge of chromite may be first fused with a bath of iron or steel and the Si reducing agent added, whereafter a further charge of chromite substantially equiv. to the reducing agent is added; or the chromite and reducing agent may be heated together and iron or steel afterwards added; or a ferro chrome may be first prep'd., excess of chromite being used as described above and the fused product may be mixed with molten Fe or steel preferably contg. dissolved O or oxides. A small proportion of a de-oxidizing agent such as ferro-Mn, silico-Mn, ferro-Si, or Al may be added to the bath prior to the addn. of the Si reducing agent. The material may be submitted to an oxidizing blow at any convenient stage, preferably in the presence of an element such as Mn which is more readily oxidizable than Cr, as described in 197,733 (above). In some cases part or all of the excess of reducible compd. may be provided by another compd. such as  $\text{Fe}_2\text{O}_3$ .

**Alloys.** B. D. SAKLATWALLA. Brit. 196,260, March 19, 1923. In a method of making Fe or steel alloys contg. any of the metals Cr, Mn, Ti, W, V, U, Mo, Ni, and Co, a reducing agent and a compd. of one or more of the alloying metals are added separately to a molten Fe or steel bath. The reducing agent, which may be Si or Si alloy or a metal carbide, or pig Fe, Mn, Ca, or Mg, may be incorporated in the bath first and the metallic compd. such as chrome ore may be incorporated in a slag layer thereon, whereupon the reaction occurs at the surface of contact of the metal and slag; or the ore, etc., may be first incorporated in the slag layer, and the reducing agent then added in successive charges.

**Alloys.** MEYER & STÜDELI, SOC. ANON. Brit. 198,222, June 10, 1922. An alloy suitable for use as a substitute for Au consists of Cu, 87-91 Ni 3.5-4.25, Fe 0.3-0.8, Ag 2.26, Sn 3.4-4.5, and Au 0.08-0.16 parts.

**Alloys.** R. S. MACKENZIE. Brit. 198,498, March 22, 1922. Cr steel and Cr-Fe alloys are made by adding to a molten steel or Fe bath, while continuing the heating of the receptacle contg. it, a mixt. of chromite and a reducing agent comprising one or more metallic silicides, such as ferro-Si or Ca silicide and not contg. C. Lime or fluorspar may be added, and the mixt. may be briquetted with a binder such as Na<sub>2</sub>SiO<sub>3</sub> or may be packed into thin Fe receptacles. The briquets or receptacles may be charged into the molten bath through an adjustable fireclay-covered pipe, the lower end of which terminates a short distance above the surface of the slag.

**Alloys.** A. GEYER. Brit. 197,288, Aug. 29, 1922. Al alloys are made by melting part of the Al in the presence of broken charcoal, adding the constituent metals having the highest m. p., heating the mixt. to a temp. at least as high as the highest m. p., then adding the remainder of the Al, and finally the metals of lower m. p. The operation is carried out in a covered crucible, oxidation being prevented by addns. of broken charcoal. The alloys may contain various metals, an alloy consisting of 95% of Al, 4% of Cu, 0.76% of Mn, and traces of Pb, C, Si, and Fe being referred to.

**Alloys.** ELECTRO METALLURGICAL CO. Brit. 197,573, June 22, 1922. A low-C Fe alloy comprises Fe, Si and Zr, the Si content being at least as high as the Zr content, and each being preferably over 10%. The Si is present in sufficient proportion to prevent the formation of Zr carbide in such quantity as to prevent a low-C content. The alloy may be made by smelting in an elec. furnace a charge comprising SiO<sub>2</sub>, a carbonaceous reducing agent and a source of Fe such as steel scrap. Other elements such as Ti may be present in the alloy in minor proportions.

**Alloys.** T. MIYAGUCHI. Brit. 195,678, Nov. 3, 1921. In the manuf. of ferro-boron or boron steel, molten Fe or steel is subjected to the action of gases evolved on heating a mixt. of boric anhydride or a boric acid compd. such as a borate and NaCl. The mixt. may be charged into a receptacle which is immersed in the molten bath, or the gases may be conducted into the bath from a receptacle where the mixt. is heated to evolve the gases.

**Alloys.** GENERAL ELECTRIC CO. Brit. 198,213, May 26, 1922. Alloys contg. Al and a metal having a higher m. p., e. g., steel or Ni-steel, are made by melting the metals separately and pouring one into the other under conditions which prevent the slags of the two metals from coming into contact, e. g., by pouring one metal from the bottom of its ladle into the other metal. The alloy of Fe, Cr and Al is described in 179,306 (C. A. 16, 3302).

**Alloys.** W. R. SALTRICK. Brit. 198,053, Feb. 23, 1922. Refined low-C ferro-chrome alloys are obtained from chromite by smelting a charge contg. Ca carbide and a low-C Si alloy, preferably high-Si ferro-Si, and refining the molten product by means of oxidizing agents, e. g., by blowing with an oxidizing blast, preferably one contg. steam, in the presence of solid oxidizing agents. Lime and other fluxes may be used in the furnace, and lime may be mixed with the Ca carbide in the prepn. of the charge. The materials are intimately mixed, or may be briquetted, the ore being present in excess. The Provisional Specification refers also to the production of Fe alloys contg. W, Mo, and V.

**Alloys.** T. GOLDSCHMIDT AKT.-GES. Brit. 197,952, May 18, 1923. Al alloys of great strength and ductility contg. Si are made by subjecting an earthy material to electrolysis in a molten fluoride bath in the absence of detrimental impurities such as Fe. If the earthy material contains insufficient Si, more may be added in the form of Si fluoride or silica. Salts of any additional constituents of the alloy required may be added to the bath, or these constituents may be added to the product after electrolysis. As an alternative to electrolysis, pure Al or an Al alloy may be melted with a fluosilicate; the alloy may take up from 5 to 20% of Si.

**Metal and alloys.** W. B. HAMILTON and T. A. EVANS. Brit. 198,323, Nov. 9, 1922. A method of reducing metals and of forming alloys comprises the formation of a bath of molten metal in a furnace, the formation of a layer of the slag thereon, and the addn. to the slag of ore contg. the oxide or other reducible compd. of a metal and an exothermic reducing agent such as Al, Si, or Mg, whereupon the metal of the ore is reduced and passes into the molten bath. The production of alloys of Fe with Cr, W, Ni, Mn, or other metals, and of alloys of Cu with Al or Sn, is referred to. In the case of Fe-Cr alloys the slag may be formed from a mixt. of limestone, mill-scale and fluorspar, and the molten bath from iron scrap or ferro-chrome. A single metal may be obtained by treating an ore consisting substantially of only one metal oxide and using

a molten bath of the same metal. Heating is continued for a short time after the reaction is complete to effect refining of the metal or alloy. Cf. 174,271 (*C. A.* 16, 1737).

**White metal alloy.** A. SCHROETTER. U. S. 1,468,407, Sept. 18. An intermediate alloy adapted for use with additional Au in the production of a white metal for use as a Pt substitute for jewelry is formed of Ni 95%, Au 2.5% and small amts. of Zn, Mg and Sb, which serve to facilitate fusion and inhibit oxidation.

**Ferro-chrome.** W. R. SALTRICK. Brit. 197,987, Dec. 29, 1921. Molten ferro-chrome is refined by means of a blast consisting of or contg. steam and H<sub>2</sub>. Other oxidizing and reducing gases may be present, such as CO<sub>2</sub>, air, and CO. The mixt. may be employed in the form of producer gas, water gas, or blast-furnace gases contg. steam or having steam added. The mixt., which may be preheated, is directed on to the surface or blown through the molten metal, the latter being maintained at 1500-1700°.

**Melting ferromanganese.** R. D. JORDAN. U. S. 1,467,516, Sept. 11. Loss of ferro-Mn in cupola melting is reduced by melting under conditions tending to small slag vol. with a slag-forming material including a limestone of high degree of purity.

**Solder-filled wire.** L. H. KIRK. U. S. 1,463,533, Aug. 21. Solder-filled wire for use in jewelry is formed of Au or other precious metal, a core of solder and an intervening layer of Cu to prevent the solder from being absorbed by the outer layer of precious metal.

**Aluminum solder.** O. REBELLO. U. S. 1,466,061, Aug. 28. Ag 53.63, Cu 57.04 and Al 64.73 parts.

**Soldering fluxes.** SOC. FERROSILITE A. R. L. Brit. 196,599, Oct. 16, 1922. A compn. for soldering cast Fe contains a highly oxidized compnd. such as Na perphosphate, and a diluent such as powd. hard solder or other metal powder with or without a small amt. of another oxidizing compnd. such as Na<sub>2</sub>BO<sub>3</sub>, in the proportions, e. g., of 6, 93 and 1%, resp. The oxidizing compnds. liberate O for the elimination of C from the Fe surface before the flux has melted.

**Coating surfaces; welding.** BRITISH METAL SPRAY CO., LTD., AND W. M. GUNLESPERG. Brit. 196,695, Jan. 27, 1922. A method of improving the character of sprayed metal, alloys, or enamel contg. metallic particles, when making deposits or welds, consists in submitting the sprayed material to elec. treatment either prior to or at the time of being deposited. The object to be coated may constitute one pole of an elec. circuit, the metallic app. from which the sprayed substance issues constituting the other. If the object is a non-conductor of electricity it may first be rendered electrically conductive by covering it with some conductive substance. In an example the current is taken from a 250-v. alternating-current lighting circuit with one ordinary lighting lamp in circuit. The gas used for projecting the substance is so regulated as to prevent oxidation. Cf. 28,001, 1912, and 25,132, 1913 (*C. A.* 9, 1229).

**Welding metals.** C. H. HOLUP. U. S. 1,466,587, Aug. 28. One of two metals to be welded together, e. g., arc welding rods, is coated with silica and Na silicate and then fused on to the other metal, e. g., railway rails to be built up with Mn steel.

**Welding with superheated metal.** H. W. SCHOENFELD, G. A. REINHARDT and E. T. McCLEARY. U. S. 1,467,625, Sept. 11. Welds are formed with metal, e. g., Fe or steel, previously superheated in a furnace.

**Welding electrodes.** A. P. STROHMAYER. Brit. 197,196, May 12, 1922. A welding electrode particularly for use in the Quasi-Arc process, which may be used for welding soft Fe and steel, and cast Fe, comprises a metal core covered with slag-forming material, the core of its covering contg. V and Ti in substantially equal proportions. The weld produced by such electrodes is said to be free from N lines. An Fe or steel core is first passed through a bath contg. finely powd. V and Ti mixed with lime and made into a slime to which Na<sub>2</sub>SiO<sub>3</sub> is added. The electrode is then wound with blue asbestos yarn, after which it is passed through a bath of soda and lime. The amt. of V and Ti used is such that the wt. of each present in the finished electrode is from 0.25 to 0.5% of the wt. of the core. Alternately an Fe core having the following % of other ingredients may be used: C 0.10, Si 0.2, P and Ti, each 0.25 to 0.50. Such a core is passed in succession through a bath of Na<sub>2</sub>SiO<sub>3</sub> and a bath of lime, after which it is wound with blue asbestos, an Al wire being introduced if desired, as described in 13,538, 1914, (*C. A.* 9, 3217), and the electrode being passed finally through a third bath of soda and lime. Cf. 1274, 1912, and 11,079, 1912.

**Electrodes for welding, etc.** E. J. CLARKE. Brit. 198,202, May 16, 1922. An electrode for welding or depositing Cu or its alloys by the elec. arc, comprises a rod of Cu or alloy of high Cu content coated with a compn. contg. a substantial proportion of a strong reducing agent. For welding Cu alloys the Cu rod may be coated with the metal which it is desired to incorporate in the weld. Alternatively the electrode may be

provided with a wrapping of thin sheet metal or wire of metal may be laid alongside or wound round the rod, the coating enclosing the added metal. The rod may be made of bronze; suitable materials for use in the slag-producing coating are specified. P, Mg, V, Si or Al may also be used for deoxidizing. For welding gun metal the core comprises Cu 89-95%, and Sn 5-11%, or a Cu core is used with a coating contg. 5-10% phosphorus. For welding Al bronze the electrode comprises Cu 93-8% and Al 2-10%, the latter being added to the coating as powdered Al-Cu contg. 50% Al. For welding Si bronze the electrode comprises Cu 95-8% and Mn 2.5%, the latter being added to the paste as powdered Mn, Fe-Mn or Cu-Mn.

**Arc-welding composition.** J. C. ARMOR. U. S. 1,467,825, Sept. 11. An arc-welding compn. adapted for welding mild steel or other metals is formed of Na zirconate 6, clay 38,  $\text{Fe}_3\text{O}_4$  10,  $\text{MnO}_2$  8 and  $\text{Na}_2\text{CO}_3$  38 parts, fused together and pulverized.

## 11 BIOLOGICAL CHEMISTRY

PAUL E. HOWE

### A—GENERAL

FRANK P. UNDERHILL

**Enzymic hydrolysis of glucosides of alcohols of the  $\beta$ -series. Indices of emulsion.** Determination of the molecular weights. H. COLIN AND MISS A. CHAUDUN. *Bull. soc. chim. biol.* 5, 382 (1923). See C. A. 17, 1956. A. T. CAMERON

**Reversibility of the enzyme action of  $\alpha$ - $d$ -mannosidase.** H. HÉRISSEY. *Bull. soc. chim. biol.* 5, 501 (1923). See C. A. 17, 2292. A. T. CAMERON

**Actual methods of purification of enzymes by adsorption.** R. FABRE. *Bull. soc. chim. biol.* 5, 432-48 (1923). A review. A. T. CAMERON

**Energetics of biochemistry.** R. WURMSER. *Bull. soc. chim. biol.* 5, 506-28 (1923). A review. A. T. CAMERON

**Influence of moisture on the formation of insoluble casein by lactic acid.** M. FOUASSIER. *Bull. soc. chim. biol.* 5, 487-90 (1923). Moisture increases the rate at which caseinogen becomes insol. in acid medium. A milk powder contg. only 1.6%  $\text{H}_2\text{O}$  retained its solv. much longer than another contg. 6.8%. A. T. CAMERON

**The swelling of gelatin in acids.** ALFRED KUHN. *Naturwissenschaften* 11, 523 (1923).—Comments on an article by Loeb (cf. C. A. 17, 1805, 1970). Exception is taken to certain results. C. C. DAVIS

**The explanation of the colloidal behavior of albuminous substances.** WO. OSTWALD. *Naturwissenschaften* 11, 523-5 (1923).—The 2 fundamental arguments of the Loeb theory (cf. C. A. 17, 1970) rest on fallacies and more evidence is necessary before the purely chem. theory can be accepted. **Remarks on the criticisms of Ostwald.** JACQUES LOEB. *Ibid.*—A reply (cf. Hill, C. A. 17, 1805). C. C. DAVIS

**Is the hydrolysis of protein by pepsin and trypsin to be considered a homogeneous reaction?** J. H. NORTRUP. *Naturwissenschaften* 11, 713-9 (1923).—A review and discussion. Evidence is submitted to show that no compd. is formed between enzyme and substrate (cf. C. A. 16, 2520) and that the abnormal behavior upon increasing the concn. of the substrate is due to some property of the latter. The mechanism of pepsin and trypsin hydrolysis is not catalytic in the classic meaning, since a part of the enzyme is not again set free but remains combined with other products (cf. C. A. 15, 2289). The reaction is represented thus: enzyme + protein +  $\text{H}_2\text{O} \rightleftharpoons$  [enzyme-protein]  $\rightleftharpoons$  enzyme-peptide  $\rightleftharpoons$  enzyme + peptone. Peptone is used as a general designation of the products of the hydrolysis of protein. If the enzyme-peptide compd. were completely undissociated, the reaction would be a simple bimol. one, since for each mol. of hydrolyzed substrate an enzyme mol. would disappear. If the compd. were completely dissociated, the reaction would be monomol., since the concn. of the enzyme would not change. In reality the reaction takes a middle course, and corresponds neither to the monomol. nor to the bimol. form. As the enzyme forms a compd. with some of the products, the equil. point must be influenced by this reaction. A bibliography is included. C. C. DAVIS

**The specific nature and the mechanism of the reaction of carbohydrate-splitting and glucoside-splitting enzymes.** RICHARD KUHN. *Naturwissenschaften* 11, 732-42 (1923).—A review and discussion with many references. The carbohydrate- and glucoside-splitting enzymes are catalysts because of the greater sensitiveness shown by the enzyme-sugar compd. towards the H ion than by the sugar itself. The cause of this may

be the strengthening of the basic nature of the ethereal O atom due to the combination of the enzyme in the sugar mol.

C. C. DAVIS

**Observations on the reaction of protoplasm to some reagents.** WILLIAM SEIFRIZ. *Ann. Botany* **37**, 489-509 (1923).—Cells of the upper surface of *Hydroa* leaves show an initial reduction of osmotic pressure when submerged in 10% EtOH, 1% saponin, smilacin, or senegin, followed by a rise to a point above normal on prolonged treatment. Only 0.1% of the cells of a leaf is killed by 10% EtOH in 10 min., 1% in 20 min., 60% in 30 min., 95% in 2 hrs., while the basal cells may survive 6 to 12 hrs. There is a like progressive killing of the cells in 1% solns. of the glucosides employed. In lower concns. of EtOH, or the glucosides there is pronounced stimulation of protoplasmic streaming, which frequently becomes abnormal in type. Evidence is presented to show that a lower crit. plasmolytic concn. is indicative of increased permeability. J. S. CARMICHAEL.

**The electrical conductivity of caseinates.** F. PLATTNER. *Kolloid Z.* **33**, 98-101 (1923); cf. Pauli and Klinger, *C. A.* **14**, 2318. Dialyzing expts. show that the high cond. of caseinate solns. cannot be due to decompr. products from the casein. Since pure preps. of Na caseinate have high cond. The slight decompr. which might occur during the expt. could not explain this phenomenon. Fish bladder was found unsatisfactory for dialyzing because of penetration by the caseinates. This opposes the view of Mändoki and Polányi (cf. *C. A.* **14**, 2572). Collodion sacks were used with better results, though these are not entirely impervious to the caseinate mols.

C. B. EDWARDS

**Reversibility of the action of urease of soy bean.** H. D. KAY. *Biochem. J.* **17**, 277-85 (1923).—Urea is produced in small quantities during the action of urease on a mixt. of  $(\text{NH}_4)_2\text{CO}_3$  and  $\text{NH}_3$  carbamate in strong soln. in water, at room temps.

BENJAMIN HARROW

**Possible significance of hexosephosphoric esters in ossification.** ROBERT RONSON. *Biochem. J.* **17**, 286-93 (1923).—An enzyme is present in the ossifying cartilage of young rats and rabbits which hydrolyzes hexosmonophosphoric acid, giving free phosphoric acid. The possible significance of the enzyme in the process of ossification in the animal body is discussed.

BENJAMIN HARROW

**Fermentation of glucose and fructose by dried yeast in the simultaneous presence of phosphate and sulfite.** FUMIWO HEMMI. *Biochem. J.* **17**, 327-33 (1923).—The fixation method of Neuberg and Reinhardt (*C. A.* **13**, 328; **14**, 1510) applied to the fermentation by dried yeast of glucose, or fructose produce acetalddehyde to about the same extent in the presence or absence of added phosphate.

BENJAMIN HARROW

**Purification of insulin and some of its properties.** H. W. DUDLEY. *Biochem. J.* **17**, 376-90 (1923).—Insulin is extd. from ox pancreas by the use of 35% alc. It is further purified by first forming an insul. picrate and from the latter, a sol. hydrochloride. 20 g. pancreas yields 1 g. of the hydrochloride—a product which shows marked protein characteristics. Insulin withstands boiling with 0.1 N  $\text{H}_2\text{SO}_4$  for 30 min., but in the presence of 0.1 N  $\text{NaOH}$ , heating to 37° for 1½ hrs. completely destroys it. It is destroyed by pepsin as well as trypsin. “Insulin appears to be a very complex protein deriv. . . . It is certainly much more complex than the active principles of the pituitary posterior lobe, probably even more so than secretin. It is more analogous in complexity to the toxins, to ricin, or to Vaughan’s toxic protein derivs.” BENJAMIN HARROW

**Presence of urease in the nodules on the roots of leguminous plants.** E. A. WERNER. *Nature* **112**, 202 (1923).—Crushed nodules taken from the well washed rootlets of *Trifolium procumbens*, *T. pratense*, *T. repens*, *Vicia sativa*, *Medicago sativa*, *Galega officinalis*, various lupins, and the garden pea, were placed separately in a 2% soln. of urea (sterilized by satn. with toluene), to which a few drops of neutral phenol red soln. had been added. A purple red color, due to  $\text{NH}_3$ , generated from the decompr. of urea, was developed in the solns., after they had been maintained at 55° for about an hr.

BENJAMIN HARROW

**Urease as a product of *Bacterium radicicola*.** M. W. BERGERON. *Nature* **112**, 439 (1923); cf. preceding abstr.—Urease is produced by the pure culture of *Bacterium radicicola*, and much more profusely than by the nodules. Such forms as *Vicia*, *Trifolii* and *Pisi* are particularly strong in this respect, while *Orrhapholis* and *Lupini* are but feebly urease producers.

BENJAMIN HARROW

**The life period of diastase.** HUGO MIRHE. *Ber. botan. Ges.* **41**, 263-8 (1923).—A sterile ext. of 112-280 yr.-old rye still hydrolyzes starch, although not so rapidly nor completely as an ext. of fresh rye. A sample of old Egyptian emmer of the 18th dynasty had, however, lost its diastatic capacity.

ARTHUR LOCKE

**The effect of certain nitrogen compounds upon the activity of urease.** E. W. ROCKWOOD AND W. J. HUSA. *Proc. Am. Soc. Biol. Chem., J. Biol. Chem.* **55**, v vi (1923).—Jack-bean urease was used and the  $\text{pH}$  was kept at 7.5 by 0.5 M phosphate

buffer soln. The N compds. were used in 0.001 *M* concn. The  $\alpha$ -aminocarboxylic acids markedly accelerated the action, the  $\beta$ -acids much less. The greater the number of C atoms between the NH<sub>2</sub> and the CO<sub>2</sub>H group the less was the effect; increasing the length of the C chain also decreased the accelerating effect. Amines, acid amides, creatine, creatinine, and uric acid were without effect and the CO<sub>2</sub>H or the NH<sub>2</sub> group alone was inactive. Stereoisomeric amino acids showed no definite difference.

A. P. LOTHROP

**Some properties of an active constituent of pancreas (insulin).** E. A. DOISY, MICHAEL SÓMOGYI AND P. A. SHAFFER. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xxxi-xxxii (1923).—The active material has been purified and concd. to a point where 0.25 mg. produced marked hypoglycemia and characteristic convulsions in rabbits weighing about 1 kg. The material is a white powder contg. about 14% of N and free from P. It gives a distinct biuret reaction, a faint Hopkins-Cole test and a doubtful Millon's reaction. Its soln. is levorotatory. It withstands boiling in 0.1 *N* HCl for 5 min. in large part. It is freely sol. in H<sub>2</sub>O except at a *pH* of about 5-6 at which reaction it is incompletely pptd. It is sol. in alc. except at its isoelec. point. It is fairly completely pptd. by 1/2 satn. of its aq. soln. with (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and appears to be an albumose or globulin. "Although there appears to be considerable uniformity in the relation between activity and wt. of substance, in various purified prepsns. made in different ways, the identity of the active substance cannot be regarded as established. The possibility remains that the protein described contains the active material as admixture." A method of prepn. of solns. suitable for exptl. work found most satisfactory by the authors is described.

A. P. LOTHROP

**The titer value of chicken fat.** J. S. HEPBURN. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xlii (1923).—The titer test was applied to 20 composite samples of abdominal fat from the common fowl, *Gallus domesticus*. The titer of the isolated insol. fatty acids ranged between 32.5° and 37.6°, the av. for the 20 samples being 34.94°.

A. P. LOTHROP

**Lipase production by the liver.** PRO V. PREWITT. *Am. J. Physiol.* 65, 287-95 (1923).—The isolated dog liver perfused with defibrinated dog blood may increase or decrease in lipolytic activity under various conditions. Lipolytic activity of the liver was detd. by extn. with H<sub>2</sub>O and testing the hydrolyzing power of the ext. on Et butyrate. The lipase content of the unperfused liver is very much greater than that of the perfused organ, the marked decrease in liver tissue following the initial perfusion not being accounted for by the slight increase in the lipase of the perfusion fluid. The addition of secretin to the perfusion fluid results in an increased lipase content of the liver tissue. Although hepatic lipase does not seem to be increased by the action of pilocarpine, interchange of lipase between liver and blood is apparently facilitated under its influence. Lipolytic activity of the liver is not altered immediately by asphyxia but changes are induced which are favorable to increased activity during subsequent perfusion.

J. F. LYMAN

**Possible sources of insulin.** C. H. BOST AND D. A. SCOTT. *J. Metabolic Research* 3, 177-9 (1923).—The presence of insulin in potatoes, rice, wheat, beet-roots and celery was demonstrated by the prepn. of exts. from these plants which when administered to rabbits caused a marked lowering of the blood sugar.

W. A. PERLZWEIG

**Permeability and the increase of volume of contents of living and of artificial cells.** D. T. MACDOUGAL. *Proc. Am. Phil. Soc.* 62, 1-25 (1923).—Changes in vol. of living and dead cell masses in various solns. have been recorded by the auxographs in expts. arranged to det. the effect of concn. and ionic mobility on permeability and hydration. The amts. of endosmosis in an artificial cell with external layers comprising the substances occurring in the relative positions in the living cell have been used as indices of permeability of such layers. Such cells are constructed with walls of cellulose holding pentosan including pectins with an inner deposit of albumins and lipins and a plasmatic or retaining layer of pentosans. The general amt. of H<sub>2</sub>O absorbed by such cells is proportionate to the isoosmotic value of the cell contents, which were solns. of sugar. The relative amts. absorbed when cells were immersed in salt solns. were found to correspond to the sp. action of the ions of the salts on the colloids of the cell. The ions of the salt solns. which penetrate the walls of the cells affect permeability of such colloids as pentosans in a degree corresponding to their velocities, and in accord with the Hardy-Schulze law. In addn., some of the bases form compds. with lipins, pectins and albumin which affect permeability. The conclusions of Kahlo that antagonisms or interferences are the result of the relative action of different ions are supported; the more active an ion may be on colloids, the less is its capacity of penetration of the colloid. Thus K shows a high rate of penetration and a lesser colloidal action than Ca which has a high

aggregating effect on colloids and a low power of penetration. The rate of endosmosis in the artificial cell increases as permeability is lessened. The series which effects a lessening permeability in the order named, according to Troendle, K, Na, Ca, is shown by artificial cells with external layers of lipid, pectin and other pentosans. The inclusion of an albuminous component in the cell results in an exaggeration of the effect of Na. Cond. tests show that cells contg. an albuminous component show the greatest absorption of ions from a Ca salt soln. and the least from a Na salt soln. with the rate in a K salt soln. lying between these two. Cond. tests of cell contents show that the abundance of the above-named bases in a decreasing series would be K, Ca, and Na in the albuminous cell. A disproportionate amt. of Na is taken from the immersion liquid, which does not pass into the cell-contents and must be absorbed by the material of the external layers or combined with some of its components, probably the gelatin. Sections of *Opuntia* immersed in salt solns. showed a slight contraction at concns. of 0.05 M in KCl, NaCl and CaCl<sub>2</sub> and in sea-water at 0.06 M. This contraction was recovered in this and in concns. as high as 0.18 M KCl, 0.14 M NaCl and 0.07 M CaCl<sub>2</sub>. These concns. are approx. isotonic and represent the soln. which will plasmolyze this material. The length of the period in which living cell-masses of *Opuntia* reached full expansion in salt solns. at 0.01 and 0.05 M concns. is proportional to the ionic velocity of the salts, the sequence of the common bases being KCl, CaCl<sub>2</sub> and NaCl, in which the time of expansion is shortest in the K and the longest in the Na soln. The period of expansion in Na solns. is much less in the pure soln. than in a balanced soln. in which the Ca is  $\frac{1}{2}$  that of the Na. A similar difference is found when sea-water is used as the balanced soln. Dried sections of *Opuntia* react chiefly as colloidal material and in accordance with the Hardy-Schulze law by which "bases carrying a charge of opposite sign to that of a colloid exert a dehydrating or aggregating effect proportional to the unit charges they carry." The hydration swelling of this material in solns. at 0.01 M gives a decreasing series which is K, sea-water, Na, Ca. The expansion coeff. of living material in salt solns. includes osmotic effects and perhaps those of chem. combinations so that the decreasing series is Ca, K, Na, the greatest expansion being in cells with the least permeable walls, in which the highest turbidity may be set up.

W. A. PERIZWEIG

**The effect of radioactive radiations and X-rays on enzymes. II. The effect of radiations from radium emanation on pepsin in solution.** R. G. HUSSEY AND W. R. THOMPSON. *J. Gen. Physiol.* 6, 1-5 (1923); cf. *C. A.* 17, 2590.—The effect of  $\beta$ - and  $\gamma$ -radiations from Ra emanation upon pepsin in soln. has been studied. The principles involved in this reaction are the same as those found with trypsin (*C. A.* 17, 2590), i.e., the change in the log. of concn. of active pepsin varies directly with the variable  $W$  which is algebraically equal to the product of the av. amt. of the Ra emanation present and the time of exposure. **III. A unit of measure of activity for radium emanation.** *Ibid.* 7-11.—This unit, the curie power, is defined as the activity of 1 curie of Ra emanation and its radioactive products in equil. with it. It expresses the activity or power of a given prepn. of Ra emanation.

CHAS. H. RICHARDSON

**The rate of growth of the dairy cow. III. The relation between growth in weight and increase of milk secretion with age.** S. BRODY, A. C. RAGSDALE AND C. W. TURNER. *J. Gen. Physiol.* 6, 21-30 (1923).—Beginning with the age of initiation of milk production (approx. 2 yrs.) and extending to the age of max. body wt. (9 yrs.), the increase of milk secretion with age follows the course of growth in body wt. Both phenomena can be accurately represented by the equation of a monomol. chem. reaction; the velocity consts. have approx. the same numerical value. Increasing body wt. contributes only 20% to increasing milk secretion. Increase in body wt. and increase in milk secretion are good measures of growth in the dairy cow. This study supports the theory that growth is limited by a chem. reaction. **IV. Growth and senescence as measured by the rise and fall of milk secretion with age.** *Ibid.* 31-40.—While increase of milk secretion and increase of body wt. follow the same exponential course till max. body wt. is reached, after this age, body wt. remains practically const. while milk secretion declines exponentially; the decline follows the course of decline of a monomol. reaction. Thus the whole course of milk secretion with age follows the course of 2 simultaneous consecutive monomol. reactions. Growth and senescence go on simultaneously throughout life; each follows an exponential law with age. The 2 processes are probably limited by 2 consecutive chem. reactions.

CHAS. H. RICHARDSON

**The rate of senescence of the domestic fowl as measured by the decline in egg production with age.** S. BRODY, E. W. HENDERSON AND H. L. KEMPSTER. *J. Gen. Physiol.* 6, 41-5 (1923).—From the beginning of egg-laying through the 8th year, the course of decline of egg production with age in the domestic fowl follows the course of decline of a monomol. chem. reaction. The course of decline of egg production here

may be taken as an index of the course of senescence of organs or tissues limiting egg production. *Senescence is a physico-chem. process* the course of which is limited by a chem. reaction. The exhaustion of oocytes is probably not the factor limiting the course of egg production.

CHAS. H. RICHARDSON

**Studies on toxicity.** E. I. FULMER AND R. E. BUCHANEN. *J. Gen. Physiol.*, **6**, 77-89(1923).—When yeast is subjected to the action of phenol or phenol and alc., the curves of the surviving cells (as measured by resistance to staining with methylene blue when plotted against time) are not logarithmic. The resemblances which have been found between these curves and monomol. reaction curves are probably superficial and fortuitous. Any method of evaluating disinfecting power, when based upon the mass law, is misleading. Variations of resistance of individual cells and the distribution of such variations are of fundamental importance in accounting for the rates of death of microorganisms. A bibliography of 23 titles is given. CHAS. H. RICHARDSON

**Membrane potentials and colloidal behavior.** A. V. HILL. *J. Gen. Physiol.*, **6**, 91(1923).—A reply to a criticism by Hitchcock (*C. A.*, **17**, 2500). Reply to a note by Professor A. V. Hill. D. I. HITCHCOCK. *Ibid.* **93**. C. H. R.

**The combination of deaminized gelatin with hydrochloric acid.** D. I. HITCHCOCK. *J. Gen. Physiol.*, **6**, 95-104(1923).—Isoelec. gelatin analyzed by the Van Slyke method gave 0.00010 equivs. of amino N per g. of gelatin. Deaminized gelatin prep'd. without heating contains 0.00010 equivs. less of N per g. than the original gelatin; no amino N could be detected in it by the Van Slyke or formal titration method. It has an isoelec. point of  $p_{H_2} 4.0$  and its max. combining capacity for HCl is 0.00044 equivs. per g. The max. combining capacity of untreated gelatin is corrected to 0.00089 equivs. per g. (*C. A.*, **16**, 3672). The difference between the max. combining capacities of the original and deaminized gelatin is 0.00015, nearly equal to the loss in amino or total N resulting from the deaminizing reaction. The combining capacity retained by the deaminized gelatin is probably due to the NH groups which are not attacked by  $HNO_3$  during deamination. This work offers a new indication of the chem. nature of the combination between protein and acid. CHAS. H. RICHARDSON

**The location of the forces which determine the electrical double layer between colloid particles and water.** JACQUES LOEB. *J. Gen. Physiol.*, **6**, 105-29(1923).—The cataphoretic p. d. of suspended particles is probably due to an excess of concn. of one kind of a pair of oppositely charged ions in the aq. film surrounding the particles. This excess of concn. is ascribed to the preferential adsorption by the particle of the kind of ion in question. The term, adsorption, however does not distinguish between the two forces which det. the unequal distribution in the film about the particles; that is, the forces which are inherent in water itself and in the particle (chem. attraction between the particle and the adsorbed ions). Expts. with ions, dyes and proteins show that they are permanently bound at the surface of colloid particles only when they exist as cations, or, in the case of proteins, when they are isoelec. The fact that isoelec. proteins form durable films on the particles suggests that ionic forces are not responsible. Salts of dyes or proteins, the cations of which form films on colloid particles, influence the cataphoretic p. d. differently than other salts; i. e., very low concns. of them make the negatively charged particles positive. Cryst. egg albumin and gelatin are effective in this respect at concns. of  $1_{100,000}$  or  $1_{50,000}$  of  $U^{\prime}_C$ . Salts in which the dye or protein is an anion do not produce this effect, but act like NaCl or  $Na_2SO_4$  on the cataphoretic p. d. of colloid particles. Amino acids do not form durable films on colloid particles and their salts behave like NaCl in regard to the effect of the cataphoretic p. d. LaCl<sub>3</sub> and similar salts do not form a durable film on these particles. These facts suggest "that the increase of the negative charge of the colloid particles caused by the addn. of low concns. of ordinary electrolytes is chiefly if not entirely due to forces inherent in the aq. soln., but to a less extent, if at all, due to an attraction of the anions of the electrolyte by forces inherent in the colloid particles." CHAS. H. RICHARDSON

**The significance of the physical-chemical condition of the cell colloids on their sensitivity to irradiation.** CHRISTIAN KROETZ. *Biochem. Z.* **137**, 372-96(1923).—Suspensions (0.2 - 0.4%) of corpuscles in isotonic salt solns. were subjected to irradiation by ultra-violet light or Röntgen rays until lysis was initiated. The time for complete lysis (without further irradiation) was detd. The Hofmeister series held: The various anions and cations had the same effect as on lysis by hypotonicity, EtOH or heat. The effects of irradiation plus EtOH or hypotonicity are additive. Irradiation affects the cell protein rather than surface colloids. Whether the stroma or blood pigment is primarily concerned could not be detd., but lysis and methemoglobin production are certainly not interdependent. These expts. show that the physico-chem. condition

of the cell protein influences sensitivity to irradiation, and also show the influence of the several ions on denatured cell protein. GEORGE ERIC SIMPSON

**The splitting of proteins with formic acid.** N. D. ZELINSKII AND V. S. SAIDKOV. *Biochem. Z.* **137**, 347-100(1923); cf. *Kurten, C. I.* **17**, 2717. On hydrolysis of gelatin (and certain other proteins) with HCOOH no amino acids were found. Probably the peptides were condensed in the presence of HCOOH and derivatives were produced which were broken up with difficulty by the acid. AcOH gave similar results. G. E. S.

**The hydrolysis of proteins by means of dilute acids.** N. D. ZELINSKII AND V. S. SAIDKOV. *Biochem. Z.* **138**, 156-60(1923); cf. preceding abstr. Proteins heated to 140-150° in 0.5 cc. 4% HCl, or in 50% HCOOH or in HOAc are completely hydrolyzed in 3 to 6 hrs. A colorless, or only slightly colored, albumin product, containing some polypeptides and a considerable amt. of different anhydrides, is obtained. The procedure should lend itself to the *prep. of bacterial cultures*. GEORGE ERIC SIMPSON

**The relation between catalytic and fermentative fission of proteins.** V. S. SAIDKOV AND N. D. ZELINSKII. *Biochem. Z.* **137**, 401-4(1923). In hydrolysis both by enzymes and by weak acids anhydrides are formed as intermediate products between the polypeptides and amino acids. GEORGE ERIC SIMPSON

**Gels from quinine and its derivatives.** P. RONA, E. SCHMIDT, AND H. ZOKKER. *Biochem. Z.* **137**, 413-28(1923); cf. *C. I.* **17**, 1031. The gels of ecaprine acetate (I), optochin sulfate (II) and quinine phosphate (III) are composed of fine acicular units showing positive double refraction, which become round clumps showing, under the polarizing microscope, a dark cross on a dark ground. These clumps aggregate to form long bands or leaflets showing marked double refraction. Gel formation precedes the formation of a second liquid phase. I is best prepd. by mixing 1 cc. 2% quinine HCl with 1 cc. of N phosphate soln. in which Na<sub>2</sub>HPO<sub>4</sub>, NaH<sub>2</sub>PO<sub>4</sub>, 1.1 g. pH = 6.7. III is prepd. by mixing 1 cc. 5% optochin-2HCl with 1 cc. 0.5 N Na<sub>2</sub>SO<sub>4</sub>. The prep. of II has given previously. It keeps for weeks; it liquifies on warming and congeals on cooling. II becomes cryst. in a few hrs., III, in a few min. Photographs G show II in different stages. GEORGE ERIC SIMPSON

**The optical rotation and molecular weight of caseinogen.** J. ZAVKOVSKII. *Biochem. Z.* **137**, 562-9(1923).—In neutral salt solns. the sp. rotation of caseinogen decreases as salt concen. increases. Alk. solns. increase sp. rotation, in proportion to the strength of the alkali. In solns. of alkali or alkali earth hydroxides the sp. rotation increases with concen. of hydroxide. A max. is reached when 0.00032 g. equivs. of hydroxide are neutralized by 1 g. caseinogen. It has been shown that about 0.0001 g. equivs. of hydroxide neutralize 1 g. caseinogen (titrants). If the compound then formed is mono basic the one here reported must contain 8 acid groups. An improved method for the *prep. of caseinogen* is detailed. GEORGE ERIC SIMPSON

**Ernst Salkowski.** C. NEUBERG. *Biochem. Z.* **138**, 1(1923). Obituary. G. E. SIMPSON

**Hartwig Franzen.** C. NEUBERG. *Biochem. Z.* **138**, 5(1923). Obituary. G. E. SIMPSON

**Nitro reductions in the living body.** WERNER LIPSCHITZ. *Biochem. Z.* **138**, 274-8(1923).—The criticisms of Waterman and Kuhn (*C. I.* **17**, 2590) are answered. GEORGE ERIC SIMPSON

**Dripwise study of protein coagulation. II. The effect of dissolved substances.** J. BECKA AND F. SINKORA. *Biochem. Z.* **138**, 326-34(1923); cf. *C. I.* **17**, 3520. By the previously described procedure, the pptn. of horse-serum protein by the alkali and alk.-earth-chlorides, by Hg<sub>2</sub>Cl<sub>2</sub>, HCl, C<sub>6</sub>H<sub>5</sub>OH, and the effect of the presence of urea and sugar on this pptn. are studied. Certain generally known facts (e.g., that bivalent ions are more effective than univalent ions) are confirmed. With increasing concen. of the electrolyte, the pptg. power of Hg<sup>++</sup> decreases, of H<sup>+</sup> increases. Urea increases the precipitability with Hg<sup>++</sup> and H<sup>+</sup> in direct proportion to its concen.; glucose, up to 0.5 M, does not affect pptn. with Hg<sup>++</sup> or H<sup>+</sup>. **III. Synergism of precipitating agents.** *Ibid.* 335-40.—The effect of mixing these precipitants is studied: 0.1 M HgCl<sub>2</sub> and Cu<sub>2</sub>SO<sub>4</sub>, 0.5 M C<sub>6</sub>H<sub>5</sub>OH, resorcinol, and pyrocatechol. The pptg. effect of the mixt. is the arithmetical av. of the effect of the components before and after mixing; the resulting diln. of each precipitant is taken into account. GEORGE ERIC SIMPSON

**Phyto-pharmacological study of some animal toxins with special reference to a menotoxin.** D. I. MACHT AND DOROTHY LUBIN. *J. Pharmacol.* **21**, Proc. 191-3 (1923).—The av. growth of seedlings of *Lupinus albus* in a 1% soln. of normal blood

serum in Shive solns. gave about 75% of growth as compared with the normal Shive; a similar soln. of menstrual serum affected the seedlings in a much more toxic way. The av. absolute growth in the length of the roots was 50% less, and the roots were curled and distorted in various ways instead of being straight. The greatest toxicity was usually found at the beginning of menstruation and was demonstrable even during the premenstrual period or a day before the actual onset of the catamenial flow. A difference in toxicity was also detd. for saliva. This "menotoxin" was also found in the red blood cells and even in the sweat of menstruating individuals. C. J. WEST

The metallic compounds of proteins. A. J. J. VANDEVELDE. *Rec. trav. chim.* **42**, 620-2(1923).—See *C. A.* **17**, 3211. E. J. WITZEMANN

#### B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Dinitrosalicylic acid as a reagent for blood sugar. J. B. SUMNER AND V. A. GRAHAM. *Proc. Soc. Exptl. Biol. Med.* **20**, 96(1922).—The method consists of taking 1 cc. of blood with 2 cc. of  $H_2O$ , adding 4 cc. of the neutral Na salt of dinitrosalicylic acid (2.94%), followed by 2 cc. of 0.1 N soln. of  $H_2SO_4$  and filtering. Three cc. of the filtrate are heated for 3 min. in a Folin sugar tube in a boiling water bath, 1 cc. of 3% NaOH is added and heat continued for 10 min. The soln. is then cooled and diluted to a vol. suitable for colorimetric reading. The standard is prep'd. by heating 2 cc. of 0.015% soln. of glucose with 1 cc. of neutral 1.78% Na dinitrosalicylate for 3 min., adding 1 cc. of the alk. and heating for 10 min. C. V. B.

Estimation of ammonia and urea in urine and other fluids. SAMUEL LEVY-SIMPSON AND D. C. CARROLL. *Biochem. J.* **17**, 391-402(1923).—The principle employed is to sep. the mixt., contg. the urea and  $NH_3$  by steam-distg. in alc.; the  $NH_3$  alone distils over under certain conditions. The  $NH_3$  and urea are then detd. in the usual way. A 1-l. distg. flask, placed at  $45^\circ$  to the horizontal, is fitted with a rubber stopper carrying a tap funnel contg. an alc. soln. of KOH colored with phenolphthalein; and a glass tube bent so that it dips into the lowest part of the flask. This tube is connected by a movable piece of rubber tubing to the steam boiler. The side tube of the flask is connected to the condenser, which is arranged as nearly vertical in position as possible. A collecting flask contg. standard HCl receives the distillate. Five-ten cc. of the fluid under investigation is mixed with 90 cc. of 96% alcohol and placed in the distg. flask. The boiler is heated and only connected to the distg. flask after a vigorous jet of steam issues from the connecting tube. The colored alc. KOH is next run in from the tap funnel until the fluid in the distg. flask is just alk. to phenolphthalein. If necessary, more potash is added during the distn. The ammonia passes over, and the distillate is ultimately titrated with  $CO_2$ -free NaOH, with alizarin-red as an indicator. (Frothing commences when the alcohol has nearly all distilled off. At this point the rubber stopper of the flask is turned round so that the bent end of the steam-delivery tube is turned up out of the fluid. The steam then passes through the distg. flask and condenser and carries away any ammonia present. This "washing" is continued for  $1\frac{1}{2}$  minutes, the collecting flask being removed and titrated.) A complete detn. of  $NH_3$  and urea may be made with one app. in 30 min., including the time taken for the conversion of urea into  $(NH_4)_2CO_3$ . A detn. of  $NH_3$  requires but 7 min. BENJAMIN HARROW

Accuracy of the Dale and Evans method of determining the hydrogen-ion concentration of blood. HAROLD TAYLOR. *Biochem. J.* **17**, 406-9(1923).—In the Dale-Evans method of detg. the  $C_H$  of blood (*C. A.* **15**, 2462 and *J. Physiol.* **54**, 353(1920)) it is conceivable that an appreciable error might occur owing to a difference of concn. (due, for example, to a Donnan equil.) produced by the membrane itself. Such an effect would result in a measurable elec. p. d. The actual p. d. has been measured and found to be small. On the av. the  $C_H$  in the blood is only 3% less than in the dialysate, an amt. smaller than the error of the method. BENJAMIN HARROW

Simplified method of preparation of the Bezssonov reagent for vitamin C and some polyphenols. NIKOLAI BEZZONOV. *Biochem. J.* **17**, 420-1(1921).—Antiscorbutic exts., quinol, catechol and polyphenols in general give a blue color with a phosphomolybdic acid of the formula  $17WO_3(MoO_4)(P_2O_5)25H_2O$  (*C. A.* **16**, 1782). The reagent is prep'd. as follows: 36 g. Na tungstate and 4 g. phosphomolybdic acid are dissolved in 200 cc. distd. water at  $50^\circ$ , then 5 cc. 85% phosphoric acid are added and 10 cc. concd.  $H_2SO_4$  are poured in drop by drop. The soln. is slowly evapd. at  $40-42^\circ$  for 24 hrs. A cryst. deposit forms. The liquid is poured off. To obtain a pure reagent without recrystn., 2-3 cc. distd. water are poured on the crystals. They are stirred slowly and

the liquid is immediately poured off. This operation is repeated until one drop of water used for washing the crystals gives a blue coloration with a quinol soln. or a brown-yellow with a pyrogallol soln. (1 in 1000 in each case). The washed crystals are dried between filter paper, then 15 g. are dissolved in 100 cc. of 5% C (by vol.)  $H_2SO_4$ . If kept in a colored bottle, this reagent can be kept for 2 months without deterioration. B. II

**The separation of the hexone bases from certain protein hydrolyzates by electrolysis.** C. L. A. SCHMIDT AND G. L. FOSTER. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, xvi (1923).—Expts. were carried out with hydrolyzed gelatin, casein and fibrin. The hydrolyzate is placed in the center of a 3-compartment cell and distd.  $H_2O$  in the end compartments, which are sep'd. by gelatin membranes. C electrodes are used. The hexone bases wander to the cathode, glutamic and aspartic acids and pigment to the anode while the other amino acids remain in the center compartment. When the  $pH$  of the center section is kept at 7.5 histidine does not wander to the cathode but at  $pH$  5 the 3 hexone bases migrate to the cathode in about the same ratio as they exist in the protein.

A. P. LOTHROP

**A gas analysis apparatus for use with chamber respiration apparatus.** T. M. CARPENTER. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, xix-xx (1923).—The graduation of the buret is so designed that a  $CO_2$  content up to 1.700% and an  $O_2$  deficit up to 2.000% can be detd.; the buret is marked in % and the smallest division corresponds to 0.01% so that estns. can be made to 0.001%. The app. is constructed on the Haldane principle.

A. P. LOTHROP

**The estimation of bile acids in icterus urine.** C. L. A. SCHMIDT AND J. A. MAX RILL. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, xx (1923).—Evap. the urine at a low temp. and dissolve the bile acids in abs. alc. Evap. off the alc., take up the bile acids in small amt. of  $H_2O$  and ppt. in the cold by satn. with  $MgSO_4$ . Wash the ppt. with a satd. soln. of  $MgSO_4$  and then dissolve it in abs. alc. Evap. the alc., dissolve in  $H_2O$ , and est. the amino-N in sep. portions of the aq. soln. before and after hydrolysis with 8% NaOH. The difference gives the N of the bile acids.

A. P. LOTHROP

**The isolation of biliverdin from bile.** W. M. BARRY AND V. E. LEVINE. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, xxxvii-xxxviii (1923).—To each l. of ox bile add 50 cc. of 10% HCl and expose to the sunlight in a large uncovered beak erunitil dark green. Carefully decant the clear supernatant liquid, warm and ext. with  $CHCl_3$  to remove cholesterol. Ext. with  $Et_2O$  until free from  $Et_2O$ - and  $CHCl_3$ -sol. substances. To the liquid remaining after this treatment add 50 cc. of 10% HCl which ppts. the pigment and bile acids. Draw off and discard the supernatant liquid. Warm the residue on a water bath until the odor of  $CHCl_3$  has disappeared. Add 4 vols. of 95% alc. and then dil. with 1.5 times its vol. of distd.  $H_2O$ . Wash the pigment which settles out repeatedly with distd.  $H_2O$ , dry, wash with  $Et_2O$  and dry again. Yield, about 2.5 g. per l. of bile. The product is free from Fe, S (absence of the green pigment, choleprasin), fat, cholesterol, lecithin and bile salts.

A. P. LOTHROP

**The original method as used for the isolation of insulin in semipure form for the treatment of the first clinical cases.** J. B. CORLISS. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, xi-xli (1923).—The original method for the prepn. of insulin from pancreas is described. Various modifications of this method have since been made "but it is of interest to note that the general principles developed in the first instance still apply to any modified process."

A. P. LOTHROP

**A simple method of estimating the salivary urease.** H. W. SCHMITZ. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, xliii-xlii (1923).—Introduce into a large test-tube (graduated at 15 and 20 cc.) 2 cc. of filtered saliva, 2 drops of M phosphate and 1 cc. of 5% urease soln. Incubate in a beaker of  $H_2O$  at 50° for 15 min. Add distd.  $H_2O$  to the 15 cc. mark, 2 cc. of dialyzed Fe (Merck's 5%), 1 cc. of 20%  $Na_2SO_4$  soln., and distd.  $H_2O$  to the 20 cc. mark. Shake vigorously and filter. Pipet 10 cc. of the filtrate (equiv. to 1 cc. of saliva) into a graduated cylinder and add 5-10 cc. of dil. Nessler soln. dependent on the N content. Rotate the cylinder until the max. color development is obtained. If a large amt. of urea is present add distd.  $H_2O$  until the color of the unknown approximates the color intensity of the standard. Since the concn. of the urea in the saliva is practically equal to that in the blood, the salivary urea estn. may be used in detg. the degree of urea retention.

A. P. LO THROP

**Electropy.** I. L. KARZAG. *Biochem. Z.* **138**, 844-96 (1923).—When certain colloids adsorb certain dyes the color base of the dye is produced as a manifestation of the chem. effect of the elec. energy on the surface of the colloidal particles. The subsequent adsorption is of minor interest. This is called electropic adsorption. It occurs under the influence of negatively charged colloids, irrespective of the charge of the dye. The process is relatively slow. For discharging the color from positively charged basic

dyes a larger negative charge is required than to discharge the color from a negatively charged acid dye. Certain other colloids produce the contrary effect: Color base is changed to dye. This is called electropic regenerative adsorption. It occurs practically instantaneously under the influence of positively charged particles. Within both groups are found dyes relatively insensitive to the electrostatic charge. Sensitivity depends on the sign and size of the charge on the dye. Since the action of the electrostatic charge is made manifest by a chem. change, the detn. of the charge by this method is termed "chemoscopy." A large no. of dyes were tested as to serviceability for this purpose. The procedure was tested on many colloids, org. and inorg. The effect of many inorg. and org. solutes on the transformation of the color base of fuchsin S was also detd. II. Electropy by electrostatic charges on cells. Chemoscopy of cells. L. KARCZAG AND F. STERNBERG. *Ibid* 397-403.—"The electrostatic properties of cells are detd. by chemoscopy *in vitro*." In descending order of the negative elec. charge, erythrocytes > protoplasm of the leucocytes > the stroma of the leucocytes. The chemoscopy of various frog organs was also detd. *in vitro*. After washing, the organs were put in 0.1% fuchsin S soln., and the extent to which the color was discharged in 24 hrs. was detd. In none of the organs was "electropic regenerative adsorption" noted: The color base of fuchsin S was unchanged. III. The chemoscopy of body fluids. L. KARCZAG AND J. VÁNDORFY. *Ibid* 404-7.—The negative charge on blood serum and cerebrospinal fluid > on erythrocytes > on leucocytes. Whether the differences are due to the character of the colloids cannot be decided on account of the presence of the OH<sup>-</sup>. Some pathological sera are investigated. IV. Chemoscopy of bacteria. L. KARCZAG AND K. HAJOS. *Ibid* 408-11.—The results obtained by a study of the chemosscopic action of a large no. of bacteria are in agreement with cataphoresis studies of others. Agglutination changes the chemosscopic properties of bacteria. V. Vital chemoscopy. L. KARCZAG AND L. PAUNZ. *Ibid* 412-28.—Fuchsin S, water blue and light green were injected subcutaneously into rabbits. After 2 to 24 hrs. the tissues were examd. macro- and microscopically for the presence of the dyes. They were unevenly distributed—chiefly as the color base. VI. L. KARCZAG. *Ibid* 429-40.—A general discussion concerning the results reported in the preceding papers.

GEORGE ERIC SIMPSON

Certified methylene blue for biochemical stains (ANON.) 25. Estimation of organic P (BAUMANN) 7.

## C BACTERIOLOGY

A. K. BALLS

The fermentation of glucose by *Fusarium lini*. A. K. ANDERSON AND J. J. WILLAMAN. *Proc. Soc. Expl. Biol. Med.* 20, 108-10 (1922).—*Fusarium lini* when grown on glucose media produces EtOH and CO<sub>2</sub> as the main by-products of metabolism. No appreciable amt. of succinic acid is produced. In the absence of glucose this organism can utilize EtOH, preferably at concn. of 2%. C. V. B.

A new microorganism bringing about the fermentation of starch and pectous materials. I. A. MAKRINOV. *Arch. sci. biol. (Petrograd)* 18, No. 5 (1915); *Abstracts Bact.* 7, 172.—An organism, *Pectinobacter amylophilum*, was isolated from soil capable of fermenting starch and pectous materials; it can act also upon the products of starch hydrolysis but not to such an extent as upon starch itself. The organism is cultivated on potatoes or on a medium consisting of 0.1 part NH<sub>4</sub> phosphate, 0.1 K phosphate, 0.05 MgSO<sub>4</sub>, 0.5 sol. starch, traces of chalk in 100 cc. distd. water. The NH<sub>4</sub> phosphate may be replaced by 0.1 part of peptone. Starches of different origin are not acted upon alike, wheat and rice starch being most readily assimilated. It does not fix atm. N, although it belongs to the *oligonitrophilic* forms, or those microorganisms which are capable of existing in the presence of traces of N. Out of 13 g. of starch decomposed, 3.02 parts were left in the medium in the form of org. materials, chiefly org. acids; these consisted of 2 parts of formic and 1 part of acetic acid, with traces of lactic and succinic acids. The rest of the starch is converted into gases, consisting of 44.5 parts of CO<sub>2</sub> and 55.5 parts H<sub>2</sub>. The starch is directly decomposed without the formation of sugars. The formation of some dextrin indicates the presence of amylase. The organism is rod-shaped, 4-6 μ × 0.5-1μ, possessing a rapid locomotion in young cultures. Elliptical spores are formed in the enlarged part of the cell (fusiform). Growth on potato is characteristic, accompanied by a rapid destruction of the potato with the formation of a gas. Optimum temp. is 30-35°. H. G.

The question of pigment formation by colorless bacteria. C. I. BUCHBINDER. *Arch. sci. biol. (Petrograd)* 21, 91-100 (1918); *Abstracts Bact.* 7, 110.—The no. of bac-

teria that can form a pigment in the medium of Lasseur and Thiry (*C. A.* 7, 1730) are much greater than they were formerly supposed to be. The pigment is formed primarily in the bacterial pellicle; the soln. is usually colored yellow or brownish, with the exception of *B. mesentericus vulgaris* and *fusca* which give red and bluish pigments, but even these last only the first week. The degree and nature of the pigment formation are affected by the compn. of the medium, aeration, temp., number of transfers, etc. No pigment is observed in the absence of iron salts. The pigment is insol. in acids, benzene, and other solvents; acetone prep'd. according to Grünbert is used as a solvent. The red pigment changes to yellow, on addn. of alkali.

H. G.

**The biochemistry of microorganisms.** I. S. L. IVANOV. *J. Microbiol.* (Petrograd) 2, 97-103 (1915); *Abstracts Bact.* 7, 174.—I. studied the fat content of yeast cells *Nadsonia fulvescens*, *N. elongata* and *Torulaspora delbrückii*. Eight-day old cultures of yeast were washed off with water from the substratum, filtered, dried *in vacuo* in the presence of  $H_2SO_4$ , finally triturated in a mortar with sand. The fat was extd. with ether, thus removing 10-15% of the dry weight. The fat was liquid, almost colorless. By detg. the acid and I indices, the following results were obtained:

	Acid index	Iodine index
<i>Nadsonia fulvescens</i>	46.1	80.4
<i>Nadsonia elongata</i>		82.9
<i>Torulaspora delbrückii</i>		35.1

The two related species of the same genus have about the same I index, while the *Torulaspora* has a much lower index. The latter organism differs from *Nadsonia* in its morphological characters, structure, evolutionary cycle, and is thus also found to differ in its physiological properties. Consequently, in solving the problems of classification and phylogeny of microorganisms, the physiological characters deserve careful attention.

H. G.

**The growth of the wheat scab organism in relation to hydrogen-ion concentration.** JEAN MACINNES. *Phytopathology* 12, 290-4 (1922); *Botan. Abstracts* 12, 348. A species of *Fusarium* isolated from scabby wheat was grown in a modified Czapek's soln. plus a mixed buffer soln. The H-ion concn. was varied by the addn. of increasing amounts of NaOH. The organism grew at all concns. between  $pH$  3 and  $pH$  11.7. This range is decidedly wider than for any fungus previously studied; and, considering the large no. of hosts attacked by this fungus, its tolerance of acid and alk. media may be significant.

H. G.

**Phagocytosis of the tubercle bacillus. III. Phagocytosis in vitro of bacilli treated with various fat solvents.** AZZO AZZI. *Arch. sci. med.* 45, 223-8 (1922, publ. in 1923).—Defatted tubercle bacilli are less actively phagocytized by guinea-pig leucocytes than the living organisms or those killed by heat. The lipoids of the bacillus therefore seem to exert a positive chemotaxis on the leucocytes rather than to serve as a defense of the microorganism.

M. HEIDELBERGER

**New mediums and technic for the isolation in pure culture of *B. tuberculosis*.** G. PETRAGNANI. *Rend. d. adunanza dell'accad. med.-fis. fiorentina, Sperimentale* 77, 101-4 (1923).—The culture medium contains milk, potato starch, peptone, egg, glycerol, and 0.02% of malachite green, which inhibits many other microorganisms but does not affect the tubercle bacillus. Addition of small amounts of the dye to Loeffler's medium for diphtheria bacillus is also advantageous.

M. HEIDELBERGER

**Anaerobes from water samples.** P. D. MEADER AND E. A. BLISS. *Am. J. Hyg.* 3, 394-400 (1923).—Expts. were made with 76 tubes of lactose broth cultures which had yielded gas but had failed to give other tests for *B. coli*. The tubes had been inoculated with raw and treated waters. Sixteen of the tubes contained anaerobes, but only 2 of the anaerobes recovered fermented lactose with the production of gas, from which it is concluded that the number of anaerobes which give false presumptive tests for the *B. coli* are not as great as generally supposed. The presence of anaerobes seemed to bear no relation to the total bacterial count in the water samples.

JACK J. HINMAN, JR.

**The role of oxygen in the oligodynamic action of metals.** KURT HERZBERG. *Centr. Bakt. Parasitenk., I Abt.* 90, 113-20 (1923).—The oligodynamic action of metals has always been considered as the action of metal salts (ions) with the same chem. process as with higher concns. It is shown that the bactericidal action is due to the condensation of O by the metal ions. Following the adsorption of metal ions by the cell walls the oligodynamic action follows only in the presence of O. The relation of the bactericidal action of a metal in the absence of O to the action in the presence of O in terms of concn. is the oligodynamic quotient and is expressed as  $Q = K(O_e)/K(O_d)$ . The proc-

esses brought about by the condensation of O are (a) direct oxidation and (b) dehydration.

JULIAN H. LEWIS

**Gelatin liquefaction by bacteria.** MAX LEVINS AND D. C. CARPENTER. *J. Bact.* 8, 297-306(1923); cf. *C. A.* 17, 2900.—The change in viscosity of a gelatin medium and simultaneous rate of increase of the formol titration were observed with 7 organisms. The viscosity was found to drop before the formol titration begins to rise. The rate of increase in the formol titration serves to distinguish 2 groups of gelatin liquefiers. A standardized method of measuring the change in viscosity in gelatin media should be superior to present methods. A temp. of  $40^{\circ}$  is suggested for this purpose. J. T. M.

**The effect of certain bacteria upon the toxin production of *Bacillus botulinus* in vitro.** IVAN C. HALL AND EMMELIA PETERSON. *J. Bact.* 8, 319-41(1923).—Toxin-forming anaerobes could not be detected in soils or human feces by toxicity tests of filtrates from glucose broth cultures without preheating. Moderately toxic filtrates were often obtained from such cultures in plain broth, indicating a symbiotic relationship with other bacteria here. Owing to its high buffer content, meat mash medium was very favorable to artificially inoculated soil cultures of *B. botulinus* in both the vacuum bottle and the constricted tube. Sterile soils did not inhibit toxin production. Impure aerobic cultures from certain soils inhibited toxin formation in glucose broth. Certain acid-producing aerobes inhibited toxin formation in glucose but not in plain broth. Some of the acid producers destroyed toxin in glucose toxin cultures. A single expt. with buffer soln. showed that an acidity of  $p_a$  2.0 did not injure the potency of toxin in 24 hrs. at  $37^{\circ}$ . JOHN T. MYERS

**Aroma-producing microorganisms.** V. L. OMELIANSKI. *J. Bact.* 8, 393-419 (1923).—A good discussion of the knowledge of the chem. processes underlying aroma production by bacteria, and their application to food industries. JOHN T. MYERS

**Preliminary note on inhibition of bacterial growth by amino acids.** G. A. WYON AND J. W. McLEON. *J. Hyg.* 21, 376-84(1923).—Amino acids in appropriate concns. aid bacterial growth, but in relative low concns. they may be inhibitory. Inhibition occurred with 10 out of 11 acids studied and with several mixts. rich in amino acids. The inhibitory concn. varies from 11 to 130 millimols per liter. The cyclic compds. were inhibitory in the lowest concns. Histidine, tyrosine, tryptophan and phenylalanine were tested. Of the chain compds. tested cystine was most inhibitory. *Staph. aureus* was able to split glycine in a high but sub-inhibitory concn. A polypeptide medium may prove valuable for bacterial growth. JOHN T. MYERS

**Reduction of sulfites by certain bacteria in media containing a fermentable carbohydrate and metallic salts.** W. J. WILSON. *J. Hyg.* 21, 392-8(1923).—In media contg.  $\text{Na}_2\text{SO}_3$ , glucose and Fe salts, reduction of sulfate to sulfide is effected by *B. typhosus*, *B. enteritidis*, *B. paratyphosus* B, and other members of the *Salmonella* group. No reduction was shown by *B. paratyphosus* A and the dysenteriae bacilli. The use of certain media contg.  $\text{Na}_2\text{SO}_3$  is recommended in attempting to isolate the typhoid group from excrement, milk, etc. The blackening caused by certain members of the typhoid-enteritis group may be due in part to the reduction of sulfate impurities in the lead acetate media, and in order to get const. results with different brands of peptone, sulfate and a fermentable carbohydrate should be added to the medium. JOHN T. MYERS

**Observations on the cultivation of anaerobes in auto-digest of pancreas.** F. P. G. DA SARO. *J. Path. Bact.* 26, 305-19(1923).—Certain exts. of pancreas prep'd. by auto-digestion gave favorable results in the culturing of anaerobes. One of these was tested in comparison with meat ext. as regards formol titration, H-ion concn., and growth of certain anaerobes. The formol titration readings were very high in the pancreas medium, and the rate of growth and survival of anaerobes were much greater. Growth was limited to the same range of H-ion concn. in both media. The dild. pancreas broth is a favorable medium for testing fermentation reactions of anaerobes. J. T. MYERS

**Catalase in bacteria and its relation to anaerobiosis.** ANNE B. CALLOW. *J. Path. Bact.* 26, 320-5(1923).—Comparative estns. were made of the catalase content of 9 anaerobes and 12 aerobes. None of the anaerobes gave gas when treated with  $\text{H}_2\text{O}_2$  and none of the aerobes except streptococci. No  $\text{H}_2\text{O}_2$  was detected when anaerobes were grown anaerobically and then subjected to the action of the air. No conclusive evidence was found that anaerobes could grow aerobically in the presence of catalase. JOHN T. MYERS

**Catalase production and sensitiveness to hydrogen peroxide among bacteria: with a scheme of classification based on these properties.** J. W. MCLEOD AND J. GORDON. *J. Path. Bact.* 26, 326-31(1923).—When the characteristics of sensitiveness to  $\text{H}_2\text{O}_2$ , power of producing catalase, and power of producing  $\text{H}_2\text{O}_2$  are taken into account, bacteria can be roughly divided into 4 groups: (1) those extremely sensitive to

$H_2O_2$  and devoid of catalase (the anaerobes), potential peroxide producers; (2) those moderately sensitive to  $H_2O_2$  and devoid of catalase (the peroxide producers); (3) those moderately sensitive to  $H_2O_2$  and devoid of catalase, but not peroxide producers; and (4) those sensitive to  $H_2O_2$  in varying degrees and producers of catalase (the majority of facultative anaerobes). This emphasizes the value of protecting stock cultures from the light. The role of  $H_2O_2$  has been overlooked.

JOHN T. MYERS

**The problem of intolerance of oxygen by anaerobic bacteria.** J. W. McLINTON AND J. GORDON. *J. Path. Bact.* 26, 332-43 (1923).—Anaerobes cannot tolerate more than very slight concns. of O<sub>2</sub> because they produce  $H_2O_2$  as soon as O<sub>2</sub> is available which kills them. Production of peroxides by anaerobes is probably the explanation of the green discoloration of heated blood media produced under certain conditions. Catalase favors the growth of *B. welchii* in O concns. that tend to retard without completely preventing growth. Exposure to light for some hours renders a medium unsuitable for the growth of anaerobes, probably owing to the formation of small amounts of  $H_2O_2$  in the medium.

JOHN T. MYERS

**The minimum concentration of oxygen for luminescence by luminous bacteria.** E. N. HARVEY AND T. F. MORRISON. *J. Gen. Physiol.* 6, 13-9 (1923); cf. *C. A.* 14, 2384, 2662, 2938, 3727.—H gas contg. known amounts of O<sub>2</sub> was passed through emulsions of luminous bacteria in sea water. By means of flow meters it was possible to det. the concn. of O<sub>2</sub> necessary to give a just perceptible light. An O<sub>2</sub> concn. as small as 0.005 mm. Hg pressure or 1 part by wt. of O to 3,700,000,000 cc. sea water was sufficient. The methods are described in detail.

CHAS. H. RICHARDSON

**Changes in the stability and potential of cell suspensions. I. The stability and potential of *Bacterium coli*.** A. H. EGGERTH. *J. Gen. Physiol.* 6, 63-71 (1923). The stability and potential of *B. coli* depend upon the strain of the organism used, the medium in which it is suspended, previous treatment of the suspension, and the length of time it has been in the medium. With an acid reaction, the negative charge on the bacteria is diminished and with some strains a positive charge is acquired. Changes in stability are accompanied by changes in potential. When acid-treated bacteria are washed at neutral or alk. reactions, the original potential is not restored, but the zone of flocculation is moved toward the alk. side. Two factors are responsible for these changes: extn. of a sol. protein which combines with the surface of the cells; a further irreversible change of the cell or the cell membrane.

CHAS. H. RICHARDSON

**Protein synthesis by Azotobacter.** O. W. HUNTER. *J. Agr. Research* 24, 263-74 (1923).—The protein content of *Azotobacter* growth obtained from a solid medium was found to be 11.81% while that collected from a liquid culture was 30.50%. The yield of cells increased with the quantity of dextrose in the medium. An av. yield of 15.7, 20.2 and 25.9% of the sugar was obtained from medium contg. 0.6, 1.1 and 1.5% of dextrose, resp. The relative quantities of N fixed per g. of dextrose for the 3 different percentages of sugar were similar, viz., 16.1, 17.0 and 17.3 mg., resp. When molasses was used as a source of energy for *Azotobacter* development there was obtained a yield of cells equal to 30.44% of the sugar in the molasses. This gives a higher percentage yield for the molasses sugar than for dextrose. *Azotobacter* is able to convert the sol. nitrogenous substances present in molasses into more complex protein, as well as to utilize the molasses as a source of energy for the fixation of N. The addition of straw to the dextrose or molasses medium did not cause any appreciable increase in the quantity of N fixed.

W. H. ROSS

**Diphtheria toxin. I. The effect of C<sub>H</sub> on diphtheria toxin.** FR. v. GRÖER. *Biochem. Z.* 138, 13-33 (1923).—The results in large part corroborate those of Walbaum (*C. A.* 16, 2881). A ppt. sol. in excess of acid is produced in diphtheria cultures by adding acid. The width of the p<sub>H</sub> zone for pptn. depends on salt concn. and age of the culture. At p<sub>H</sub> 3 to 4, the ppt. contains practically all the toxin. The material thus pptd. originates in large part during bacterial growth. Thus diphtheria toxin is an amphoteric electrolyte whose toxic and acid properties are associated. The toxicity is altered by changing the p<sub>H</sub>. The optimum of p<sub>H</sub> for toxicity is between 8.5 and 9.2. II. Toxin formation. *Ibid* 34-42.—The toxicity of a culture depends (1) on toxin formation, (2) activation of the toxin mol. by the alkyl. of the medium, and (3) autolysis. Actual toxicity at any p<sub>H</sub> is distinguished from "absolute" toxicity which is the toxicity at optimum p<sub>H</sub> 8.6-8.8.

GEORGE ERIC SIMPSON

**The nature of the neutral red reaction in bacterial cultures. I.** HANS GEILINGER AND CARL SCHWEIZER. *Biochem. Z.* 138, 72-91; *Mitt. Lebensm. Hyg.* 14, 241-9 (1923).—The substance responsible for the reduction of neutral red in Bornand's reaction originates in the meat ext., not in the agar. The presence of agar improves the reaction. This may be through promotion of anaerobic conditions, or possibly a sub-

stance present in the meat ext. reduces by giving rise to nascent H. The conditions for the production of the biochemical neutral red reaction. *Ibid.* 92-118.—The canary-yellow color and green fluorescence produced in this reaction is a reduction product. Excess of O may cause this to revert to the original dye. The green-fluorescent substance is red in acid reaction. It can be extd. with amyl alc. and thus sepd. from unreduced neutral red. Sugars and sugar alcohols are a source of nascent H; they also stimulate growth and thus promote O consumption, hence their beneficial effect. Acid formation from sugar is unfavorable, except in anaerobic cultures, where the development of the orange-yellow color as a result of alkalinity is prevented. Free H may arise from the H<sub>2</sub>O in the medium as a result of intramolecular respiration. The reaction is of value in detecting the presence of many polluting organisms other than *B. coli*; the green fluorescence is the criterion; gas evolution is of aid in detecting the presence of *B. coli* only.

GEORGE ERIC SIMPSON

**Effect of acidification on toxicity of *B. botulinus* toxin.** J. C. GEIGER AND W. E. GOUVIENS. *U. S. Public Health Repts.* 38, 2249-52 (1923).—Brottenbrenner and Schlesinger have reported that acidification of botulinus toxin increased its potency. G. and G. repeated these expts. and reached the following conclusions: Toxins of 4 strains of *B. botulinus* were not increased in potency at any pH regardless of the length of exposure. The acid mixts. employed were HCl-Na citrate and HOAc-Na citrate mixts. Injection of 1 cc. buffered HOAc of pH 4.0 caused death of mice. This occurred whether the toxin was present or absent. The HOAc seemed to have a selective action since other acid mixts. did not kill the mice. F. W. TANNER

**Oxidase reaction of various groups of bacteria.** L. D. FELTON. *J. Exptl. Med.* 38, 291-307 (1923).—Pneumococci under aerobic conditions produce an oxidase when grown on suitable medium. The sera of any of 7 different animal species constitute such a medium, the degree of oxidation by the pneumococcus depending upon the animal from which the serum was taken—rat, guinea pig, rabbit, horse, man, cat and chicken in order of diminishing suitability. Conditions favoring the oxidation of *p*-aminoleucomalachite green by a single strain of pneumococci are: the presence of a slight amt. of hemoglobin, dextrose, H-ion concn. on the acid side, and heating of fresh serum for 30 min. at 56°. Conditions preventing the oxidation are: sterilized meat infusion, 1% peptone, plain broth, a high concn. of hemoglobin and absence of O. Of 22 other microorganisms studied, only *Streptococcus viridans* and *S. hemolyticus* gave evidence of oxidative power. Hemolytic streptococci of human and bovine origin were studied. The only variation in the type of reaction was manifested by those of milk and cheese origin. Strains from these sources showed the least oxidase activity. Streptococci from mastitis and cow's udder were indistinguishable by the test from the hemolytic streptococci of human origin. C. J. WEST

#### D—BOTANY

B. M. DUGGAR

**Influence of ammonium sulfate on plant growth in nutrient solution and its effect on hydrogen-ion concentration and iron availability.** LINUS H. JONES AND JOHN W. SHIVE. *Ann. Botany* 37, 355-77 (1923).—(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> was substituted for KNO<sub>3</sub> in 20 representative solns. of the 84 comprising Tottingham's series which contain KNO<sub>3</sub>, KH<sub>2</sub>PO<sub>4</sub>, Ca(NO<sub>3</sub>)<sub>2</sub> and MgSO<sub>4</sub> in various preps., and cultures of soy beans in these were compared with plants in the unmodified solns. The total osmotic concn. in all solns. was one atm. Uniform lighting conditions were provided by growing the cultures on a rotating table. The cultures were continued 5 to 6 weeks' (to flowering), the solns. being renewed every 4th day; the pH concns. of the used solns. were detd. colorimetrically. The solns. of the Tottingham series became less acid, those of the (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> series more acid. The plants of the (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> series could utilize Fe from FePO<sub>4</sub>, when 0.5 mg. per l. was present, but FeSO<sub>4</sub> was highly toxic; the injury was proportional to the amt. present. Cultures in the Tottingham series could utilize FeSO<sub>4</sub> in amts. of 0.25 to 0.5 mg. per l., but became chlorotic with FePO<sub>4</sub> if less than 1 mg. per l. was employed. An excess of FeSO<sub>4</sub> produced in both series a very characteristic brown speckling of the leaves, less pronounced in the Tottingham series. The max. yield of dry tops and roots was obtained with Tottingham solns. in which FeSO<sub>4</sub> was the source of Fe when the vol. mol. proportion of KNO<sub>3</sub> was 0.0020, and good yields of both were confined to a narrow range on either side of this concn. With the (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> series, max. yields of roots and tops were obtained, with FePO<sub>4</sub> as the source of Fe, with a vol. mol. proportion of 0.0014 for (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, and the yields decreased with increase of this proportion. In both series, wide ranges in the proportions of the other salts showed little effect upon the yield.

JOSEPH S. CALDWELL

**Diurnal variations in the total nitrogen content of foliage leaves.** A. C. CHINNALL. *Ann. Botany* **37**, 511–8 (1923).—A review of the published results of several workers in which the comparative accuracy and sources of error for the various methods employed are discussed. The data are considered to establish the fact that there is a withdrawal of N from foliage leaves at night. JOSEPH S. CALDWELL.

**Relation between the physical state of protoplasm and its functioning. I. Photosynthesis.** R. WURMSER AND R. JACQUOT. *Bull. soc. chim. biol.* **5**, 305–15 (1923).—Warming marine algae for 2 min. between 35° and 15° according to the species suppresses chlorophyll assimilation while respiration persists. If photosynthesis is a system of coupled reactions, the above can be accounted for by modification under the influence of heat of the state of the colloids constituting the chloroplasts. A. T. CAMERON.

**Presence of loricrin in eleven new species of indigenous orchids.** P. DE LAUNAY. *Bull. soc. chim. biol.* **5**, 398–408 (1923).—See C. A. **17**, 1982. A. T. C.

**The storage of phosphoric acid in beet leaves.** JOSEF URBAN AND JAROSLAV SOUCEK. *Listy Českého chemického spolku* **40**, 551–4; Z. Zuckerind. čechoslov. Rep. **47**, 53–6 (1922); *Chem. Zentr.* **1923**, I, 546.—An investigation of the % and the abs. amt. of  $P_2O_5$  in the individual leaves of sugar beets and turnips. The results are summarized in tables and diagrams. The abs. amt. of  $P_2O_5$  increases during growth up to a definite point, followed by a decrease to a min. in the yellow drying leaves. Two sugar beet leaves (each weighing 24.7 g. with 11.1% and 11.5% of dry substance, resp.) contained 18.9 and 18.8 mg. of  $P_2O_5$ , whereas in 2 old yellow leaves (weighing 26.5 g. and 20.6 g. with 7.5% and 6.7% dry substance, resp.) it was only 5.9 and 2.9 mg., resp. The max.  $P_2O_5$  found in turnip leaves (*Brassica rapa*) was 16 mg., decreasing to 3.3 mg. in an old leaf. The amt. of  $P_2O_5$  in % of dry substance is higher in the thin part of the leaf than in the leaf stalk and decreases uniformly and rapidly as the leaf becomes old. Based on the dry substance, the max. %  $P_2O_5$  occurs in the central leaf (1.82%), the min. in old and withering leaves. C. C. DAVIS.

**A plant gum in the flesh of the oil palm fruit.** E. FICKENDEN. *Kolloid Z.* **33**, 107–9 (1923).—The fresh fruit is crushed, and acids, sugars and oils are removed by exts. with alc. and acetone. The dried residue (gum) is dissolved in hot water and pptd. from a weakly acid soln. by alc. It is again dissolved, dialyzed and pptd. as a gelatinous mass. In concd. soln. in water it yields a viscous adhesive liquid. 0.7–0.85% gum is obtained from the flesh of the fruit. It is hydrolyzed by dil. HCl, forming sugars and acids. Long heating of the fruit causes hydrolysis of the gum. C. B. EDWARDS.

**The starch of Hevea brasiliensis.** W. BOHILJOFF. *Arch. Rijksb. Nederland. Indie* **4**, 71–118 (1920); *Botan. Abstracts* **12**, 600.—Starch occurs in the cortex and in the wood of this species, while the cambium contains none. Starch storage in cells surrounding the latex vessels, and its disappearance in the cortex, when the tree is tapped, suggest that there is a close relation between latex formation and starch supply. The large amt. of starch normally stored indicates that there need be no fear of depletion of food supply by tapping even during the wintering season. H. G.

**Artificial formation of calcium oxalate crystals in plant cells.** N. PATCHOVSKY. *Biol. Centr.* **39**, 481–9 (1919); *Botan. Abstracts* **12**, 460.—Previous work of P. showed that plants in which no formation of Ca oxalate crystals take place, lack oxalic acid in the cell sap. Investigations here reported seem to prove that in such cases exposure to weak solns. of K oxalate of less than fatal toxicity resulted generally in a more or less pronounced formation of Ca oxalate crystals, and that the amt. of crystal formation was related to the toxic effect of the oxalate soln. on the plant (under expt.). This formation of Ca oxalate crystals indicates a means by which plant cells become protected against the toxic effects of oxalic acid, in that the Ca salt of the cell sap combine with the oxalic acid to form an insol. salt. H. G.

**A rare carbohydrate in waxy maize.** PAUL WEATHERWAX. *Genetics* **7**, 568–72 (1922); *Botan. Abstracts* **12**, 560.—The endosperm of the Chinese waxy type of maize has been shown to consist entirely of a hitherto rare and ephemeral carbohydrate, erythrodextrin, a dextrin which stains red with I. The value of this discovery in the genetic analysis of this character is pointed out and the further suggestion is advanced that a consideration of the fundamental phys. and chem. nature of the endosperm of sweet corn would harmonize the somewhat divergent views of maize inheritance now in existence. The Asiatic distribution of the cereals having the carbohydrate erythrodextrin is noted, but no significance is attached to this fact. H. G.

**Is gaseous nitrogen a product of seedling metabolism?** JEMIEL DAVIDSON. *Bet. Gaz.* **76**, 95–101 (1923).—Wheat seedlings and cow pea seedlings were grown in Kjeldahl flasks under sterile and non-sterile conditions. The results indicate that no N in gaseous

form is lost in the process of germination and in the early life of the seedlings as an inherent function of the metabolic processes.

BENJAMIN HARROW

**Translocation of carbohydrates in the sugar maple.** J. ADAMS. *Nature* 112, 207(1923).—Dixon's view that the translocation of org. substances can take place through the vessels of the xylene (see *Nature* 109, 236(1922); *C. A.* 17, 1044) seems to explain the behavior of the sugar maple. The vessels of the wood are able to carry the sugar soln. in both directions in the tree-trunk and the rate of flow is comparatively rapid.

BENJAMIN HARROW

**The medics or burr trefoils.** E. BREAKWELL. *Agr. Gaz. N. S. Wales* 33, 418-26 (1922).—The percentage compn. of *Medicago denticulata* is H<sub>2</sub>O 19.85, ash 2.55, fiber 4.08, albuminoids 5.67, ether ext. 1.29, carbohydrates 66.56%. *M. lacinata* contains H<sub>2</sub>O 27.5, ash 2.94, fiber 5.97, albuminoids 6.56, ether ext. 1.75, carbohydrates 55.28%.

K. D. JACOB

**The law of action of growth factors.** E. A. MIRSCHERLICH. *Z. Pflanzenernährung und Düngung* 1A, 49-84(1922); *Biedermann's Zentr.* 51, 280-5(1922).—The external factors affecting plant growth may be divided into phys. factors such as climate, soil, luminous heat or elec. energy and water, and chem. factors present in the soil as plant food elements and in the air as O<sub>2</sub>, N, and CO<sub>2</sub>. From exptl. evidence and mathematical calcns. M. deduces a law which he asserts governs the effect of external factors on plant growth and yield. The plant yield is limited by a large series of growth factors each of which exerts a quite definite and independent qual. and quant. influence on the amt. of the yield. With the increase of each of these factors the plant yield increases proportional to the yield which under the given conditions fails in respect to the max. attainable yield. The law does not entirely agree with Liebig's law of minimum.

K. D. JACOB

**The action of specific sugars upon higher plants.** F. BOAS AND F. MERKENS-SCHLAGER. *Ber. botan. Ges.* 41, 187-90(1923).—0.8% Ca(NO<sub>3</sub>)<sub>2</sub>, which scarcely injures the germination of other plants, arrests the germination of *Lupinus luteus*. In the *Lupinus* cell a great proportion of the colloidal protein is distributed in fat-poor regions which expose it to the coagulating action of the Ca ions. Germination will proceed, however, if carbohydrate is added. Galactose has the greatest protective effect, arabinose next, and sucrose none. Galactose and arabinose are constituents of the cell wall.

ARTHUR LOCKE

**The range of variation of the compensation point in the gas exchange of plants.** RICHARD HARDER. *Ber. botan. Ges.* 41, 194-8(1923).—The compensation point has no const. position but varies as external conditions are varied, shifting more than 100% according to whether previously illuminated or shaded plants are examd. The difference persists even after an absence of illumination of ten days. The highest values for the compensation point were found in land plants since water plants are always somewhat shaded.

ARTHUR LOCKE

**Contribution to the study of the scalding (stretta) of wheat.** Researches on the physical, chemical and agricultural characters of the caryopses. ALFONSO DRAGHETTI. *Staz. sper. agrar. Ital.* 54, 257-77(1921).—A marked characteristic of the caryopses of wheat is that of changing their immediate compn. and their exterior appearance more or less perceptibly with variations in the conditions of the climate, soil and cultivation. The manifestation of scalding which is the more harmful the later the varieties, with respect to the meteorological conditions of the region, is connected with intense heat and dryness overtaking the more or less immature crops. D. compares data on the crops of 2 consecutive years, 1919, which was almost normal and 1920, exceptionally dry and hot during the spring months. The yields for 1920 (from 22 different races of wheat) were characterized by a greater content of N and crude protein in all the varieties except one (*Apulia*) which is a very early variety, resistant to dryness, and which gave normal caryopses. This greater % of nitrogenous compds. is due to the drying of the imperfectly developed grains and to consequent deficient accumulation of carbohydrate reserves. The % of sol. N does not appear to be influenced, since in some varieties it was almost the same or a little more notwithstanding that all the other characters might be considerably changed. The hard caryopses of 1919 were richer in N than the soft ones of the same year; in 1920 the soft ones contained more N than the hard. Therefore the notion that hard wheats are always richer in nitrogenous matter is true only when reference is made to normally developed and matured wheats.

ALBERT R. MERZ

**Further experiments on the absorption of ions by plants, including observations on the effect of light.** D. R. HOAGLAND AND A. R. DAVIS. *J. Gen. Physiol.* 6, 47-62 (1923); cf. *C. A.* 17, 2594.—The conditions of illumination exert a significant influence on the absorption of ions from dil. solns. by *Niella clavata*. They also influence the

penetration of Br and NO<sub>3</sub> into the cell sap. The absorption of ions under these conditions involves energy exchanges, light being the ultimate source of this energy. Apparently, absorption is closely related to growth and metabolism. One ion may influence the absorption of another ion present in the same soln.; anions probably thus affect other anions, cations other cations and anions other cations. SO<sub>4</sub> and PO<sub>4</sub> ions exert less effect on the absorption of NO<sub>3</sub> than Cl or Br ions. SO<sub>4</sub> ion probably does not penetrate readily to the surfaces at which the other ions become effective. Data are given on the influence of temp. on the absorption of ions. Higher temps., 22.5–25°, were more effective than lower, 12.5–15°.

CHAS. H. RICHARDSON

**Soluble carbohydrates of the wheat grain in the course of development.** H. COLIN AND H. BELVAL. *Compt. rend.* 177, 343–6 (1923).—Wheat grains were analyzed from the time of pollination to the time of maturity to det. the rotatory powers, [α]<sub>D</sub> and [α]<sub>25</sub>, reducing sugars, sucrose, starch, levulosan, and the ratio of glucose to fructose. In grains newly formed the warm alc. ext. contained about 6% of levosine, 1.5 sucrose and 1.0 reducing sugar; these sugars constitute the reserve of sol. carbohydrates. After extg. with alc. the grain gave no dextrin when extd. with cold water. As the season advanced there was a diminution in the amt. of each constituent of the sol. carbohydrate reserve, and an increase in the amt. of starch. At maturity the reducing sugar was only 0.15%, sucrose 0.5 and levosine 0.6, while the starch had risen from about 5.0 to over 50%, and the ratio glucose/fructose rose from 0.25 to 0.82. The sol. carbohydrate reserve is therefore mainly a levulosan the same as exists in the stems, and the same as the levosine of Tannet.

L. W. RIGGS

**State of the oil in the reserve cells of oleaginous seeds.** A. POLJCAR AND G. MANGENOT. *Compt. rend.* 177, 346–8 (1923).—The modifications of the disposition of oil in the cytoplasm are studied microscopically throughout the course of germination and with special reference to the disperse phases, oil-cytoplasm and cytoplasm-oil.

L. W. RIGGS

**Changes in the composition of the fruit of Bassia longifolia after it is gathered.** G. J. FOWLER AND TALWAR DINANATH. *J. Ind. Inst. Sci.* [7] 6, 131–45 (1923).—The analytical methods employed are given in detail. Fruits if plucked when near the ripening stage contain small amts. of sucrose and Fehling-reducing sugars, which increase considerably if the fruits are allowed to remain at the ordinary room temp. for a day or two. The quantity of cane sugar is at a max. on the third day of resting; after this the cane sugar and total fermentable sugars decrease. The quantity of starch decreases very rapidly in the first 2 days of resting. The tannins are almost const. till the third day; then they begin to disappear. These changes in the compn. of the fruit can be explained by assuming the degradation of the starch of the fruit by the enzymes present. Amylase is very active during the first day, invertase during the first 2 days, and maltase during the first 3 days after which they all gradually diminish in effect. It is advised to collect the fruits near their ripening stage, allow them to rest for 3 days and after sepg. the seeds from the now pulpy fruits to utilize the pulp as a source of alc.

L. W. RIGGS

**Chemical composition of the walls of certain algae.** MARY E. WURDACK. *Ohio J. Sci.* 23, 181–91 (1923).—Representatives of *Vauchia*, *Cladophora*, *Oedogonium*, *Spirogyra*, *Zygema* and *Draparnaldia* were studied. All filaments were mounted in distd. water and examd. in polarized light. The results of the optical examm. were checked by color reactions, hydrolysis and solv. of membranes. In the forms studied the cell walls are composed of at least 2 layers, an inner one of cellulose and an outer one of pectose or of chitin. When chitin is present, pectose forms a middle layer of the cell wall. In some forms as in *Vauchia* and *Draparnaldia* the pectose is difficultly permeable to a soln. of ammonia cupric oxide and a soln. of I in KI. In other forms as in *Cladophora glomerata* and *Oedogonium irregular*, a third layer composed of chitin is present, and in *Oedogonium crassum amplum* a layer of an unidentified substance. These outermost layers surround the filament and may be sepd. from it by appropriate reagents. These membranes are difficultly permeable to Cu and I reagents until partially hydrolyzed. Mucilaginous sheaths of the algae studied are of pectic compds. of which pectic acid predominates, with pectose in some cases.

L. W. RIGGS

**Hydrogen-ion concentration and the development of Sclerotinia apothecia.** W. N. EZEKIEL. *Science* 58, 166 (1923).—The perfect or apothecial stage of this fungus, which causes brown rot of stone fruits, arises in the spring from old mummified fruits on the ground. These mummified peaches, with the sporophores sufficiently developed to protrude from the sclerotia as light-brown rod-like stipes, were suspended in glass tumblers contg. unbuffered HCl and NaOH with a pH range of 4.5 to 7.0, and the fungus developed rapidly to maturity in all. Similar peaches were partly buried in sand in pots

and S was dusted on in amts. equiv. to 100, 500 and 1000 lbs. per acre. This caused a temporary inhibition of growth for 6 days, after which the fungus grew more rapidly than in the controls. The soil soln. in the treated pots had a  $p_H$  of 3.5. The optimum  $p_H$  for young apothecia was near 2.5 with good growth from 1.4 to 5.8. At  $p_H$  6.8 growth occurred, but the fungus did not mature, and above 7.7 no growth was observed. In more mature apothecia growth was observed up to  $p_H$  9.5. Addn. of  $\text{Ca}(\text{OH})_2$ , equiv. to 125 lbs. per acre to the sand in the pots, hindered growth for 10 days after which it was rapid; the  $p_H$  fell from 6.81 to 6.55 during the first 14 days. Slight alky. therefore inhibits the growth of *S. apothecia*. L. W. RIGGS

**Growth and composition of orange trees in sand and soil cultures.** H. S. REED AND A. R. C. HAAS. *J. Agr. Research* 24, 801-14 (1923).—The growth of citrus trees in sand cultures compared very favorably with that in soils. Analyses of the leaves, shoots, trunks and roots of the trees showed both a high Ca content and a high Ca/N ratio. The ash of all parts of the trees was markedly rich in K and relatively poor in Na. The Mg in the various parts of the trees was relatively low compared to Ca, and the ash from all parts of the trees contained large amts. of carbonate. The leaves and shoots contained approx. the same percentage of total P and the trunks and roots considerably less. The percentage of total S was approx. the same for the corresponding parts of the trees in both sand and soil cultures, the shoots and roots in every case contg. but a trace. The total ash content of the parts examd. was greater in each case for the sand than for the soil cultures. W. H. ROSS

**Composition of the sap from bleeding of vines.** L. MOREAU AND E. VINET. *Compt. rend. acad. agr. France* 9, 554-7 (1923). F. M. SCHERTZ

**Variability statistics as auxiliary science to plant biochemistry. III. Variation in the amygdalin content of the seeds of some stone fruits.** S. BLUMER. *Biochem. Z.* 137, 125-32 (1923); cf. *C. A.* 17, 1044; 3524.—Homogeneous material obtained from a single tree showed that the percentage amygdalin content of various stone fruits followed a binomial curve. A negative correlation between seed wt. and % amygdalin content was generally found. GEORGE ERIC SIMPSON

**The viscosin of fungi.** N. N. IVANOV. *Biochem. Z.* 137, 320-30 (1923); cf. *C. A.* 17, 3357.—Unripe fruiting bodies of *Lycoperdon piriforme* contained 11-26% viscosin which contained 6.1-6.5% N and 0.98-1.14% P. On hydrolysis a reducing substance was obtained; 92% of the N was in the form of amino N. The lack of glucose and of amino acids and the presence of glucosamine in the hydrolysate suggest that viscosin and the chitosans are intermediate products in the synthesis of chitin from glucosamine. From ripe fruiting bodies substances were isolated with 5.37-6.72% N and 0.94-3.94% P. These yielded glucosamine on hydrolysis. GEORGE ERIC SIMPSON

**The nature of the protein of fungi.** N. N. IVANOV. *Biochem. Z.* 137, 331-40 (1923).—From the powder of ripening fruiting bodies of *Lycoperdon piriforme* 2 products are obtained on hydrolysis by 2%  $\text{H}_2\text{SO}_4$  by pepsin, or by momentary warming with strong HCl: (1) an alc.-sol. peptone-like substance. After complete hydrolysis of this with acids, 58% of the total N was recovered as diamino N. (2) An alc.-insol. substance contg. P and yielding glucosamine on hydrolysis. On careful hydrolysis of the original powder a product was obtained which was probably a primary decompn. product. It contained P, 12 ± 0.2% N, and yielded the above substances on hydrolysis. It was originally united with viscosin (see preceding abstr.) in the form of a typical P-contg. glucoprotein. GEORGE ERIC SIMPSON

**Presence of maltose in the reserve organs of "Mercurialis perennis L."** P. GILLOT. *J. pharm. chim.* 28, 118-54 (1923); cf. *C. A.* 17, 1492.—The dextrogyrate sugar present with cane sugar is identified through its osazone as maltose. It is not a transitory product, but persists throughout the year. Its amt. is at a min. in March and April, then grows rapidly to a max. in Sept., and slowly diminishes, becoming const. from Nov. to Feb., i. e., during the underground life of the plant. It also must be considered a reserve principle. S. WALDBOTT

**Chemical and physical characters of certain mucilaginous extracts of seaweeds.** P. HAAS AND BARBARA RUSSELL-WELLS. *Pharm. J.* 111, 94, 127; *Chemist & Druggist* 99, 147 (1923); cf. *C. A.* 15, 3865.—The presence of Ca ions in the viscous aq. solns. of these seaweeds classes them among colloidal electrolytes. A 1.5% soln. of the cold- $\text{H}_2\text{O}$ -sol. constituent gave an osmotic pressure of 0.57 atm., and elec. cond. expts. (F. C. Harwood) showed that Ca was 65.1% ionized. The complex S-acid is dibasic. Osmotic pressures are also shown in similar exts. of several species of red algae, including agar-agar (*C. A.* 16, 946). S. WALDBOTT

## E.—NUTRITION

PHILIP B. HAWK

NORMAL

**Experiments on vitamin A.** H. C. SHERMAN AND M. M. KRAMER. *Proc. Soc. Exptl. Biol. Med.* **20**, 201-2 (1922).—Young rats at weaning time have stores of vitamin A in their bodies which permit growth for a period of time in the absence of this vitamin in their diet. The survival period for full-grown rats deprived of vitamin A depends upon the amt. of vitamin supplied before the beginning of the test. This factor has not been fully appreciated in previous expts.

C. V. B.

**The basal metabolism during pregnancy and the puerperium.** HOWARD P. ROOR AND HESTER K. ROOR. *Arch. Intern. Med.* **32**, 411-21 (1923).—Report of a series of detns. of basal metabolism in a primipara in a pregnancy uncomplicated by disease or by increase in adipose tissue. The basal metabolism was normal in the fourth month but, thereafter, it rose steadily until, on the 11th day before delivery, the increase was 23% in total metabolism and 7.6% in calcs. per kg. body wt. Following delivery, the total metabolism fell, within 3-4 weeks, to 9.6%, below that in the 4th month, although the body wt. was only 3% lower.

I. GREENWALD

**Studies in the synthesis of hippuric acid in the animal organism.** V. The influence of amino acids and related substances on the synthesis and rate of elimination of hippuric acid after the administration of benzote. W. H. GRIFFITH WITH H. B. LEWIS. *J. Biol. Chem.* **57**, 1-24 (1923).—The rate of excretion of hippuric acid in rabbits during a 6-hr. period after the oral and intravenous administration of NaOBz in doses of approx. 1 g. per kg. body wt. was decidedly increased by the simultaneous administration of glycine. This effect was not due to stimulation of excretion for Na hippurate (in amt. equiv. to that of NaOBz used in other expts.) was completely eliminated within 6 hrs. of its intravenous administration. It was not due to more rapid absorption of HOBz from the intestine for the same effect was observed when NaOBz was administered intravenously and glycine orally or subcutaneously. It was not due to the stimulation of general metabolism, for the administration of alanine did not increase the rate of excretion of hippuric acid. The simultaneous administration of *alanine, cystine, leucine, norleucine, isovaline, aspartic acid, glycocic acid, glycolaldehyde, glucose, urea* or of NaOAc with the NaOBz did not increase the rate of excretion of hippuric acid. “It was considered improbable that any of these substances is a readily available precursor of glycine.”

I. GREENWALD

**The influence of the positive nitrogen balance upon creatinuria during growth.** V. J. HARDING AND O. H. GAEBLER. *J. Biol. Chem.* **57**, 25-45 (1923).—From the results of Falchi (*Arch. Path. Anat.* **7**, 57 (1854)), Myers and Fine (*C. A.* **7**, 1221) and of Baumann and Hines (*C. A.* **10**, 2749), it is calc'd. that the retention of 1 g. N in the growing dog is associated with the absorption of 58 mg. creatine. Allowing for this, it was found that the creatine production in 3 growing dogs increased with increasing N intake to a max. which was reached at max. N retention. On a const. N diet, the creatine excretion varied inversely with the amt. of N retained. The total creatine coefficient (creatinine + creatine in the urine + creatine retained divided by body wt. in kg.) is more than twice as great as the creatinine coeff. of the adult dog.

I. GREENWALD

**Extraction of vitamins from yeast and rice polishings with various water-miscible solvents.** CASIMIR FUNK, BENJAMIN HARROW AND JULIA B. PATON. *J. Biol. Chem.* **57**, 153-62 (1923).—Exts. of yeast made with 50, 60, 70 and 80% EtOH, 60 an d70% NiOH, 70% PrOH, 70% BuOH, 70% isobutyl alc., 70% acetone, 70% MeEt ketone, and 70% HOAc were analyzed for total N and solids and were tested for vitamin B with pigeons and rats, for vitamin D with yeast and for coenzyme by the method of Harden, Thompson and Young (*C. A.* **5**, 400). The most complete extn. was obtained with 70% EtOH but this ext. also contained the most solids and N. Considering the relatively small amt. of nitrogenous and other impurities obtained, 70% AcMe appeared to be the best solvent for extg. the vitamins. The content of vitamins B and D was roughly parallel in the various exts. but the concn. of coenzyme bore no relation to that of either B. or D. With rice polishings, 60% EtOH gave better results than 70%. The exts. from rice polishings seemed to be particularly active when tested on rats and, by comparison, far less so when tested on pigeons.

I. GREENWALD

**Studies in inorganic metabolism.** I. The influence of cod-liver oil upon calcium and phosphorus metabolism. B. SJOLLEMA. *J. Biol. Chem.* **57**, 255-70 (1923).—Expts. on 2 rabbits showed that the administration of cod-liver oil decreased the Ca loss when the Ca balance was negative and increased the retention when the balance

was positive. In the first case it was chiefly the excretion in the feces and, in the second, that in the urine that was decreased. Rabbits may excrete in the feces 3 times as much Ca as is contained in the feces and still give feces with the same % of Ca as in periods of Ca retention. This indicates a great mobility of the Ca of the bone and a significance of Ca for the functions of the intestine. The total output of P is independent of the amt. of Ca in the food; a positive P balance may be observed when the output of Ca is 3 times as great as the intake. II. The influence of crude fiber and of protein upon calcium and phosphorus metabolism. *Ibid* 271-84.—In expts. upon a rabbit, an increase in the crude fiber content of the diet increased the fecal output of Ca, even when the Ca balance was already negative. In such periods, the increase in the feces was partly compensated for by a decrease in the urinary excretion of Ca. At the same time, the N and P of the feces were only slightly affected. A high-protein diet diminished the fecal Ca excretion. The rabbit failed to mate (2 trials) and subsequently died from liver cirrhosis. The testicles showed defective spermatogenesis. I. GREENWALD

**Experiments on the utilization of the calcium of almonds by man.** MARY SWARTZ ROSE AND GRACE MACLEOD. *J. Biol. Chem.* 57, 305-15(1923).—In expts. on women in which about 73% of the Ca of the diet was derived from almonds, there was a daily output of 5-6 mg. Ca per kg. body wt. on an intake of 4.1 mg. per kg., indicating that Ca equil. could be secured about as efficiently as when milk furnished 70% of the Ca. When the almonds contributed 85-86% of the Ca, the indicated requirement was 8-12 mg. Ca per kg. I. GREENWALD

**The creatine-creatinine metabolism of man and the things that influence it.** MAX BÜRGER. *Klin. Wochschr.* 2, 33-5(1923).—A good review. MILTON HANKE

**Study of rats on a normal diet irradiated daily by the mercury vapor quartz lamp or kept in darkness.** HARRY GOLDBLATT AND K. M. SOAMES. *Biochem. J.* 17, 294-7 (1923).—Two litters of rats were placed on normal diets contg. an optimal amount of Ca, P, and the "fat-sol. org. factor." In the diet of one litter this last was supplied by cod-liver oil, while for the other, 2 diets, one contg. butter and the other cod-liver oil, were used. One half of each litter was kept in the dark and the other in daylight with the addn. of a daily irradiation for 20 min. under a Hg vapor quartz lamp. No appreciable difference was found between the growth of the 2 groups or histology and Ca content of the bones. BENJAMIN HARROW

**Study of the relation of the quantity of fat-soluble organic factor in the diet to the degree of calcification of the bones and the development of experimental rickets in rats.** HARRY GOLDBLATT. *Biochem. J.* 17, 298-326(1923).—When rats are used which have only a small "store" of fat-sol. org. factor, grading the content of that factor in their diet results in a corresponding gradation of the % of Ca in their bones. Histologically some of the rats on the diets very deficient in fat-sol. org. factor show slight to severe osteomalacia or rickets. Rats with a large "store" of fat-sol. org. factor show but slight gradation of the % of Ca in the bones, when the content of the fat-sol. factor in their diet is graded. In the absence of exposure of the animals to direct sunlight or artificial substitutes for it, the fat-sol. org. factor in the diet, by itself, plays an important role in the mechanism for the deposition of Ca in the bones of rats. A normal diet contg. 10% (per wet wt.) of fresh summer butter proved as good as one contg. an optimal quantity (3.6%) of cod-liver oil. BENJAMIN HARROW

**Effect of air, which has been exposed to the radiations of the mercury-vapor quartz lamp, in promoting the growth of rats, fed on a diet deficient in fat-soluble vitamins.** E. M. HUME AND H. H. SMITH. *Biochem. J.* 17, 364-72(1923).—Rats fed on a diet deficient in fat-sol. vitamins, when kept in glass jars which had been exposed to the Hg-vapor quartz lamp for 10 min. every 2nd day, showed prolongation of normal growth over controls not so treated. Rats exposed to the air contg. O<sub>2</sub> drawn over the quartz lamps and passed through 3 m. of glass tubing, 0.8 cm. bore, showed poorer growth than the control animals. Cf. *C. A.* 17, 803. BENJAMIN HARROW

**Influence of reaction on the oxidation of the antiscorbutic factor in lemon juice.** S. S. ZULVA. *Biochem. J.* 17, 410-5(1923).—An active juice made approx. 0.05 N alk. ( $p_H$  12.5) and kept at this  $p_H$  for 24 hrs. under strictly anaerobic conditions did not deteriorate to a marked extent, while the same juice, having the same reaction, when exposed to the air during the same period failed to protect or even to delay the onset of scurvy in guinea pigs in a dose about 5-6 times larger than that which protected the animals from the disease when the juice was kept anaerobically. When the  $p_H$  was 2.2 the inactivation by aeration at 100° was definitely delayed. BENJAMIN HARROW

**Note on the conservation of the potency of concentrated antiscorbutic extracts.** S. S. ZULVA. *Biochem. J.* 17, 416-7(1923).—Z. has prep'd. a stable antiscorbutic prep'n. by making use of the fact that in a slightly acid soln., and in the absence of air, the anti-

scorbutic substance remains active for a long time.  $2\frac{1}{4}$  liters of lemon juice were treated with an excess of  $\text{CaCO}_3$  and 3 vols. abs. alc. and filtered. The filtrate was concd. to 0.1 its vol. and acidified slightly. It was then stored in a conical flask in an evacuated bell-jar over alk. pyrogallic acid for 3 months. No loss of potency was observed.

BENJAMIN HARROW

**Effect of rations low in lime on the offspring of cattle.** G. F. FINLAY. *Agri. Gaz. N. S. Wales* 33, 198-200 (1923).—A brief review of work by other investigators.

K. D. JACOB

**The urinary sulfur of fasting steers.** T. M. CARPENTER. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, iii-iv (1923).—Two steers of about 600 kg. body wt. were fasted for 5, 7, 10, and 14 days. The following max. and min. amts. of the 3 forms of S (calcd. as  $\text{S}_2$ ) were found: inorg. sulfate 2.88 and 0.02 g.; ethereal sulfate 4.23 and 0.05 g.; neutral S 1.73 and 0.11 g. The % distribution was, resp.: inorg. 0.4 to 75.6; ethereal 2.7 to 93.7; neutral 8 to 50. The % of neutral S was, in general, more const. than the other two. The N:S ratio averaged about 20:1 and was fairly const. except in the 7-day fast.

A. P. LOTHROP

**The metabolism of galactose. I. The threshold of tolerance in normal individuals.** A. W. ROWE. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, vi-vii (1923).—In a series of expts. carried out with 17 normal women and 16 normal men the dose of galactose causing a definite appearance of this sugar in the urine was 30 g. for men and 40 g. for women. It is suggested that the evident sex difference rests on Folin's tissue absorption theory and potential mammary function in females. In pathol. cases showing a high threshold 15 g. of urea were given with the galactose test meal and blood and urine urea curves showed that the high level was not dependent upon retarded absorption.

A. P. LOTHROP

**The antiketogenic action of glucose.** G. E. SIMPSON. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xxiv (1923).—"The urinary excretion of acetone bodies is detd. for short intervals after the ingestion, by normal starving men, of (a) glucose alone, (b) hydroxy butyric acid alone, and (c) glucose and hydroxybutyric acid simultaneously. The anti-ketogenic effect of small quantities of glucose is at its height within a few hrs. after ingestion."

A. P. LOTHROP

**Stability of vitamin in cod-liver oil.** H. STEINBOCK, J. H. JONES AND R. B. HART. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xxvi (1923).—Five cc. of cod-liver oil or the unsapon. material obtained from 5 g. of cod-liver oil given 6 weeks-old-puppies daily furnish sufficient vitamin for normal growth, normal Ca and P in the blood serum, normal ash content of the bones and normal distribution of the inorg. materials in bone. The essential dietary accessories in cod-liver oil are, therefore, not destroyed by the sapon. process.

A. P. LOTHROP

**Studies on by-product yeast.** J. S. HEPBURN. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xii-xlii (1923).—"Thoroughbred albino rats were fed a diet consisting of purified foods to which dried yeast had been added as the sole source of the  $\text{H}_2\text{O}$ -sol. vitamin B. Three grades of by-product yeast were used: (1) bottom yeast derived from the manuf. of industrial alc. from waste molasses, (2) brewery yeast and (3) ale yeast. All 3 grades were dried by the Wittemann process. The rats grew and reproduced and the offspring likewise gained in wt. When the dried yeast from the industrial alc. plant was included in the ration fed to immature chickens, they showed excellent gains in wt."

A. P. LOTHROP

**A comparative study of basal metabolism in normal men.** F. G. HOBSON. *J. Hyg.* 21, 363-89 (1923).—Dryer's formula,  $W_s/C \times A^{0.1432} = K$ , where  $s$  is approx. 0.5, and  $K$  is 0.1015 in males, expresses the basal metabolism in a very satisfactory manner over a wide range of body size and age. It is better to use the normal calcd. wt. instead of the observed wt. for calcn. Healthy individuals whose observed wt. shows considerable deviations from their calcd. wt. may have a normal metabolism when considered in relation to their calcd. wt. In individuals leading a healthy normal life,  $K$  in Dryer's formula is nearer 0.0990 than 0.1015.

JOHN T. MYERS

**Estimation of metabolism from determinations of carbon dioxide production and the estimation of external work from the respiratory metabolism.** MAJOR GREENWOOD AND ETHEL M. NEWBOLD. *J. Hyg.* 21, 440-50 (1923).—No estimate of the respiratory metabolism based on the  $\text{CO}_2$  output alone is of much use in assessing individual cases. The methods are of value in obtaining averages in a no. of cases.

J. T. M.

**The influence of the mother's diet during pregnancy and lactation upon the growth, general nourishment, and skeleton of young rats.** V. KORENCHÉVSKII AND M. CARR. *J. Path. Bact.* 26, 389-98 (1923).—When the mother is fed during pregnancy or lactation on a diet deficient in fat-sol. A vitamin or Ca there is a marked increase in disorders

of nutrition and rachitic changes in the skeleton of the offspring kept after weaning on a diet deficient in fat-sol. A or Ca. When the mother is fed during pregnancy on a diet rich in fat-sol. A and Ca there is a marked decrease in disorders of nutrition and rachitic changes in the skeleton of the offspring kept on a deficient diet even when the mother was kept on the same insufficient diet during lactation. Feeding the mother on a diet rich in Ca and vitamin A during lactation hinders for a considerable time nutritional and rachitic effects in the offspring kept on a diet deficient in vitamin A. J. T. M.

**The effect of purification of casein on its food value.** CASIMIR FUNK, JULIA B. PATON AND LOUIS FREEDMAN. *J. Metabolic Research* 3, 1-11(1923).—Casein prep'd. from a soln. of Na caseinate which had been shaken with fuller's earth in the presence of  $H_2O_2$  was found to be inadequate in nutritive value for rats and devoid of substances stimulating the growth of streptococci. These deficiencies could not be compensated by the addition of activated fuller's earth. W. A. PERLZWEIG

**Clinical observations with insulin. II. The influence of carbohydrate and protein on diabetes and the insulin requirement.** J. W. SHERRILL. *J. Metabolic Research* 3, 13-59(1923).—A large number of protocols of dietary expts. on diabetic patients under insulin treatment are given and the conclusions drawn are: "Carbohydrate has a stronger glucosuric effect and creates a higher insulin requirement than the caloric equiv. of any other kind of food. Protein ranks below preformed carbohydrate in respect to glucosuric effect and insulin requirement when the substitution is made on a basis of either equal caloric value or theoretical glucose content. Though hypoglycemia may be prevented by sufficiently large quantities of protein, this influence is surprisingly feeble and is by no means in proportion to the theoretical glucose value. Assumptions of a specially powerful glucosuric influence of protein, on the ground either of its sp. dynamic or a supposed toxic action, are thus proved to be contrary to fact. There is no const. scale of insulin dosage for the assimilation of any given quantity of carbohydrate. The ratio between grams of glucose and units of insulin varies widely not only in different patients but also in the same patient under different conditions. Glucosuria and insulin requirement are governed to a very important degree by the total caloric value of the diet."

**III. The influence of fat and total calories on diabetes and the insulin requirement.** F. M. ALLEN. *Ibid* 61-176.—After an extensive review of the literature and a presentation of many exptl. data the following conclusions are reached: "The insulin requirement of the organism is governed not only by carbohydrate but also by fat and all other elements entering into the diet or metabolism. It remains uncertain whether insulin is directly concerned in total metabolism, or whether it is specifically related to the assimilation of glucose alone and only in some indirect manner with the metabolism of other foods. It can only be said that the body cells somehow require insulin for their nutrition and consume it at a rapid rate in their life processes. Its anabolic function is probably as important as its catabolic function. The min. insulin requirement compatible with sugar-freedom can be crudely estd. in depancreatized animals and in patients with maximally severe diabetes in a state of extreme inanition. This requirement may be as low as 4 units a day in a young child, but is probably 12 units or more for an adult. Any diet sufficient for maintenance of life even on the lowest plane of nutrition probably requires a doubling of these figures. The need for insulin is related quant. to the body mass as well as to the amt. of food to be metabolized. Under comparable conditions of nutrition the insulin requirement of children is lower absolutely but higher per kg. than that of adults. The max. insulin requirement is created by temporary emergencies such as infection or acidosis, from causes which are not understood. The max. ordinary requirement is created by luxus diets and increases of wt. Special emphasis should be given to 2 facts: 1st, the increased need for insulin resulting from an increase of adipose tissue is fully as great as that which is created by an increase of active protoplasm in the muscles or viscera; 2nd, this increased need not only occurs during the building up of this new tissue but also continues undiminished as long as the extra tissue is kept. Insulin is used not only for building but also for maintenance of the body mass. The exaggerated insulin requirement with luxus diets and obesity explains the diabetogenic influence of these conditions. The expts. showing the influence of fat, total calories and body wt. upon the insulin requirement confirm in all details the investigation upon which the undernutrition treatment of diabetes was founded. The theoretical position is thus strengthened on both sides. On the one hand the undernutrition treatment is justified as against opposed dietary proposals. On the other hand, the exact correspondence of the results with insulin to the former modifications of tolerance by diet supports the belief that insulin is the true internal secretion of the pancreas and that diabetes is due solely to a deficiency of insulin." W. A. PERLZWEIG

**The production of sterility with nutritional regimes adequate for growth and its**

**cure with other foodstuffs.** H. McL. EVANS AND KATHARINE S. BISHOP. *J. Metabolic Research* 3, 233-316 (1923).—A standard diet used for studies on growth failed to give normal fertility in a large number of female rats. The diet consisted of casein 18, corn starch 51, lard 15, milk fat 9, salt mixt. 4, and dried yeast 0.4-0.6 g. daily. On this diet the early stages of gestation occurred in a normal way, but 80-100% of the implantations were resorbed. This form of sterility may either be prevented or cured after its appearance in any individual case by the addition of the following natural foodstuffs to the basic ration: lettuce, whole wheat, wheat-germ, rolled oats, dried alfalfa or large quantities of milk fat. The quality or quantity of the protein, the nature of the salt mixt., and the proportion of fat and carbohydrate in the ration were shown not to exert any influence on the production of this sp. sterility deficiency disease. The unknown fertility-conferring factor (*X*) could not be identified with the known vitamins A, B, C, or D. The factor *X* does not seem to be stored for long periods in the animal body, and it is resistant to ordinary cooking temps. W. A. Pratzweil.

**Nasal sinusitis produced by diets deficient in fat-soluble A vitamin.** AMY L. DANIELS, MARGARET E. ARMSTRONG AND MARY K. HURTON. *J. Am. Med. Assoc.* 81, 828-9 (1923).—Rats fed a diet low in fat sol. A may die from a bacterial invasion of the ear and nasal cavities before the appearance of the characteristic xerophthalmia. As the infection advances it leads to an apparent nutritional disorder in which the animal is not restored to a normal condition by feeding rations contg. the fat sol. A vitamin. L. W. RIGGS.

**Existence of a hitherto unknown dietary factor essential for reproduction.** H. McL. EVANS AND KATHARINE S. BISHOP. *J. Am. Med. Assoc.* 81, 889-92 (1923). See *C. A.* 17, 1045. L. W. RIGGS.

**Food selection versus food compounding.** A. E. TAYLOR. *J. Am. Med. Assoc.* 81, 892-4 (1923).—An address. L. W. RIGGS.

**\* Pathological effects of lack of vitamin A and of antirachitic vitamin.** E. V. McCOLLUM. *J. Am. Med. Assoc.* 81, 894-7 (1923).—The damage to the lacrimal and to the salivary glands is described. The effects of variations in the total and relative amts. of Ca and P, also the effects of several fats on bone development are discussed. L. W. RIGGS.

**Metabolism experiments with Filipino students in the U. S.** FRANCISCO O. SANTOS. *Phil. J. Sci.* 23, 51-65 (1923).—A metabolic study by standard methods was conducted with 4 healthy male Filipino students who were pursuing post graduate studies at Yale. The object of the work was to learn whether it is possible for Filipinos who have resided one year or more in the U. S., and have become accustomed to American diet, to remain in N equil. when given a Filipino diet of rice, fish, meat and vegetables. The results are shown in 8 tables. A positive N balance was obtained in all of the series. In no case was the caloric intake of each person less than 14% above the basal requirement. L. W. RIGGS.

**Growth-promoting value of the proteins of the palm kernel, and the vitamin content of palm-kernel meal.** A. J. FINKE AND D. BREESE JONES. *J. Agr. Research* 25, 165-9 (1923).—The proteins of corn, palm-kernel meal were found adequate for the normal growth of young rats when fed in a diet balanced with respect to the other dietary factors and when the meal constituted 80% of the diet, equiv. to 15.5% of protein. When the meal was reduced to 40% of the diet it did not furnish sufficient vitamin A to prevent xerophthalmia, and a like quantity did not provide sufficient vitamin B for normal growth. W. H. Ross.

**The rest-nitrogen of the blood in pigeons with avitaminosis and in starved pigeons.** D. ALPERN. *Biochem. Z.* 138, 142-9 (1923).—Changes in body wt. and in body temp. were similar in both groups. Amino acid N, which ran parallel to the rest N, increased in both groups. The alc.-ether sol. fraction also showed a slight increase. G. E. S.

**Is it possible to compensate stunting due to vitamin deficiency by inorganic substances?** G. SUDA. *Biochem. Z.* 138, 269-73 (1923).—Rats receiving daily administrations of  $As_2O_3$  with a vitamin-free diet did not differ in their growth from those receiving no  $As_2O_3$ . Therefore, the increase in assimilation through vitamin administration is unrelated to the increase effected by  $As_2O_3$  administration. G. E. SIMPSON.

#### ABNORMAL

**Experimental tuberculosis in rats on varied diets. Protein and salt factors.** LINDA B. LANGE AND NINA SIMMONDS. *Am. Rev. Tuberculosis* 7, 49-50 (1923).—No significant difference was noted in the reaction to infection of rats infected with bovine tubercle bacilli by subcutaneous inoculation on diets of varying protein content, adequate, high and low, either in the general condition and wt. curves or in the gross and

microscopic autopsy findings. Rats on a diet deficient in salts but otherwise adequate showed a more diffuse and extensive local reaction at the site of inoculation, a slower dissemination and a slower elimination of the lesions. H. J. CORPER

**Metabolic studies in pernicious anemia.** R. B. GIBSON AND C. P. HOWARD. *Arch. Intern. Med.* **32**, 1-16(1923).—Observations were made on 11 cases of pernicious anemia and 1 each of aplastic anemia, pregnancy anemia, hemolytic icterus and splenic anemia. The concn. of fat in the whole blood and plasma in pernicious anemia was low and tended to increase with improvement in each case. The I absorption of the fats was high, but not excessive. Low figures for blood and plasma cholesterol were obtained in pernicious anemia and splenic anemia. More favorable N and especially Fe balances may be more readily established in pernicious anemia and some other anemias when diets rich in food Fe and comparatively low in energy and N content are given. Positive Fe balance may exist at the same time as negative N balance. The urines showed high values for uric acid, low for urea and moderate for NH<sub>3</sub>, in proportion to the total N. The utilization of fat on diets rather poor in fats varied from 72 to 89%. The I absorption of the feces fat was rather low. I. GREENWALD

Observations on one hundred and ninety-two consecutive days of the basal metabolism, food intake, pulse rate and body weight in a patient with exophthalmic goiter. C. C. STURGIS. *Arch. Intern. Med.* **32**, 50-73(1923).—A patient with exophthalmic goiter was under observation for 200 days, during which time the basal metabolism, resting pulse, food intake and body wt. were detd. practically every day. Basal metabolism can be detd. within an error of 5% and, usually, within 3%. After several weeks in bed, the variation from day to day, even during the menstrual periods, was rarely more than 5% but before that time, even after 10 days in bed, values as much as 23% higher might be obtained. The maintenance requirement of the patient was about 85% greater than the basal metabolism. An acute tonsilitis, with fever, produced a marked increase in metabolism with coincident restriction of food intake. Such infections are dangerous. Four Röntgen-ray treatments over the thyroid gland at intervals of 3 weeks had no effect on the course of the disease. Ligation of 2 thyroid arteries was followed by a transient drop in the basal metabolism and removal of approx. half of the gland had a similar effect. Permanent results are not reported. I. GREENWALD

**Studies of diabetes mellitus. II. Results of treatment by diet adjustment with reference to maintenance requirement and the ketogenic-antiketogenic balance.** W. S. McCANN, R. R. HANNON, W. A. PERLZWIG AND EDNA H. TOMPKINS. *Arch. Intern. Med.* **32**, 226-58(1923); cf. *C. A.* **17**, 2450.—“Calcs. of the ketogenic-antiketogenic balance from the foodstuffs actually metabolized in diabetic subjects show that a max. of 1 mol. of antiketogenic substance is required for the complete oxidation of 1 mol. of ketogenic substance. Frequently less than 1 mol. of antiketogens will suffice. . . . The substitution of glycerol for carbohydrate is a successful means of combating ketosis in certain cases.” I. GREENWALD

**Diet and the border-line of acetonuria.** R. S. HUBBARD AND F. B. WRIGHT. *J. Biol. Chem.* **57**, 115-20(1923); cf. *C. A.* **17**, 1985.—“Diets contg. between 1 and 2 mols. of ketogenic for each mol. of antiketogenic material were fed to 4 arthritic subjects, and the amt. of the acetone bodies excreted in the urine was detd. . . . The amts. found were small, and could be explained by Shaffer's theories of ketogenesis.” I. GREENWALD

**Relation of certain blood constituents to a deficient diet.** T. J. THOMPSON AND I. L. CARR. *Biochem. J.* **17**, 373-5(1923).—There is a marked increase in the uric acid and creatinine content of the blood with the onset of polyneuritis. B. HARROW

**A clinical investigation into the relationship of the fat-soluble A vitamin to the etiology of rickets.** DOUGLAS GALBRAITH. *Quart. J. Med.* **16**, 321-40(1923).—An improper diet or an excess of carbohydrate is not a necessary etiological factor. Rickets develops on almost any diet. Spontaneous healing of bones and clinical improvement was observed during summer months, even with a low fat-sol. A diet. Radiographic improvement almost always followed cod-liver oil. Massage and ultra-violet light caused improvement. JOHN T. MYERS

**Fasting and diet in the treatment of epilepsy.** D. F. WEEKS, D. S. RENNER, F. M. ALLEN AND MARY B. WISHART. *J. Metabolic Research* **3**, 317-64(1923).—An extensive study of fasting and various dietary treatments of a large number of epileptics in various stages and degrees of the disease failed to reveal the presence of any metabolic element in the mechanism of epilepsy. The new facts discovered were a great tolerance of epileptics for one-sided high-fat diets without the production of acidosis or other clinical symptoms, and a remarkable hyperglycemia which developed in these patients on high fat diets and not with any of the other diets. W. A. PERLZWIG

**Effect of removal of the spleen in the case of defective alimentation.** CHARLES RICHTER. *Compt. rend.* **177**, 441-5(1923); cf. *C. A.* **17**, 3202.—Three series of expts.

were made with dogs from which the spleen had been extirpated. The animals were fed rations (a) of cooked meat, rice bouillon and sugar of which the animals could partake at will, (b) cooked meat and sucrose, (c) alternate 7 days of starvation and 7 days of feeding raw meat, cooked meat and bread. Normal control dogs were fed parallel rations for each series. The feedings were continued 126, 34, and 124 days, resp. The results showed that if the feeding is normal and suitably regulated, dogs with the spleen removed can assimilate their food as well as the controls. A 4th series of 5 dogs was fed rations of cooked meat alone and cooked meat with varying proportions of rice starch making a defective or insufficient diet. In this series the dogs with spleen removed died before the control animals.

L. W. RIGGS

**The antirachitic influence of egg yolk.** HORTON CASPARIS, P. G. SHIPLEY AND BENJAMIN KRAMER. *J. Am. Med. Assoc.* **81**, 818-9 (1923).—Rickets is not beneficially influenced by a diet of milk and cereals. The addn. of one or two eggs a day to such a diet will initiate healing, which is usually evident within 3 weeks after the egg feeding is begun. The chem. changes in the blood serum and the roentgenographic changes in the bones are similar to those which follow the administration of cod-liver oil. The addn. of 10% egg yolk to a rickets-producing diet will initiate healing of rickets in the rat in 6 days.

L. W. RIGGS

**Use of basic diets in the treatment of nephritis.** W. D. SANSTUM, N. R. BLATHERWICK AND FLORENCE H. SMITH. *J. Am. Med. Assoc.* **81**, 883-6 (1923).—The acidity or alky. of 45 common food articles is tabulated. Directions are given for the prepn. of menus and a typical basic (alk.) ration is shown. Ten patients with arterial hypertension and chronic interstitial nephritis showed a marked improvement in symptoms after being fed the alk. diet for periods varying from 3 weeks to 5 months. By these basic diets the acidity of the urine may be reduced to a  $pH$  of 7.0 or more. This study demonstrates that many of the so-called normal diets contain far too large a proportion of the acid-forming foods. Perhaps such acid diets may be a factor in the etiology of blood-vessel damage.

L. W. RIGGS

**The composition of the blood in experimental avitaminosis.** P. M. SUSKU. *Biochem. Z.* **137**, 405-12 (1923); cf. Ishido, *C. A.* **17**, 3202.—A group of pigeons was fed a vitamin-free diet with an adequate salt mixt.; a second group was given A and C vitamins, but no salt except NaCl. Group 1 decreased in wt. more quickly, and showed a decrease in erythrocyte count, hemoglobin, color index, and polymorphonuclear leucocytes. Group 2 showed a slower decrease in wt., an increase in erythrocytes and lymphocytes, with normal hemoglobin and color index. Thus ability to hold Fe is lost in avitaminosis, while when A and C are available Fe remains normal in amt., although none is ingested.

GEORGE ERIC SIMPSON

Determination of fatty acids in butter fat (HOLLAND, *et al.*) 12.

## F—PHYSIOLOGY

ANDREW HUNTER

**Protein content of frog plasma.** R. A. BIETER AND F. H. SCOTT. *Proc. Soc. Exptl. Biol. Med.* **20**, 120 (1922).—Kjeldahl detns. were made on oxalated blood plasma; the total  $N_2$ , reckoned as all protein, and the factor 6.25 gave the total protein as 0.8%, which is approx. 10% of that of mammals. This small colloidal content would permit of filtration at a pressure much less than the 10 mm. Hg reported by Hill and McQueen as the capillary pressure of frogs.

C. V. B.

**The effects of graded saturation of the circulatory blood on the respiratory response to the administration of carbon dioxide and on the total oxygen consumption of the dog.** R. GESSEL, C. S. CAPP AND F. FOOTE. *Proc. Soc. Exptl. Biol. Med.* **20**, 174 (1922).—The blood was satd. with CO; pulmonary ventilation increased;  $O_2$  consumption decreased; and the respiratory response was not as const. as when the blood vol. was decreased by hemorrhage. The symptoms in either case are due to disorder in oxidation and in the transportation of gases. Hemoglobin and the vol. flow of blood are important factors in respiratory control.

C. V. B.

**The effect of increase of blood pressure on the concentration of colloidal dyes in the plasma.** F. H. SCOTT, M. RABINOWITZ AND A. RUPP. *Proc. Soc. Exptl. Biol. Med.* **20**, 227-8 (1922).—Congo red was injected into the blood of an 18 kg. dog; 5 min. later the concn. was detd. and considered as 100. The blood pressure was raised by adrenaline or by section of the vagi and 19 min. after the injection the concn. was 111%. The dog had approx. 693 cc. of plasma and the vol. had evidently been decreased 63 cc. The results parallel expts. in which hemoglobin changes were followed; these expts. indicated changes in fluid vol. and not changes in the mass of circulating cells. Colloids do not leave the blood as fast as the  $H_2O$ .

C. V. B.

The effects of diets varying in caloric value and in relative amounts of fat, sugar, and protein upon the growth of lymphoid tissue in kittens. R. LEFROLZ. *Am. J. Anat.* 32, 1-35(1923).—A high calorie diet, in which the excess calories are provided from sugar or protein, will cause a marked increase in the amt. of lymphoid tissue in the buccopharyngeal cavity and intestines; the increase will be greater if the excess calories are provided as fat. Other lymphoid tissue is not definitely affected. A. T. CAMERON

Comparative elimination of total nitrogen, urea, amino acids and ammonia during waking and sleep. I. Physiological conditions. G. FONTÈS AND A. YOVANOVITCH. *Bull. soc. chim. biol.* 5, 348-62(1923).—See *C. A.* 17, 2309. II. Total inanition. *Ibid* 363-71.—These day and night ratios are not altered by inanition. A. T. CAMERON

Phosphorus content of meconium. M. PARAT AND M. DELAVILLE. *Bull. soc. chim. biol.* 5, 409-12(1923).—Measurement of P content of meconium from different parts of the alimentary tract with fetuses at different ages leads to the conclusion that in the small intestine the meconium is a source of nourishment from the 3rd to the 8th month but in the large intestine is merely an unusable excretion. A. T. CAMERON

Relation between hydrogen-ion concentrations of urines and the natures of their unorganized sediments. C. O. GUILLAUME. *Bull. soc. chim. biol.* 5, 455-64(1923).—Formation of urinary sediments can commence in urines of  $p_H$  less than 7. There is for each a max. acidity above which their formation is not possible. A. T. CAMERON

Partition of urea in blood (plasma and corpuscles) and cerebrospinal fluid. M. POLONOVSKI AND C. AUGUSTE. *J. physiol. path. gén.* 21, 267-82(1923); cf. *C. A.* 17, 1054.—Expts. on dogs show that corpuscles contain less urea than the surrounding plasma; the endosoma alone participates in osmotic changes, and contains urea at the same concn. as the surrounding plasma; peripheral venous blood contains more urea than arterial blood and than cerebrospinal fluid (man), the content of the choroid plexus (arterial) blood being of the same order of magnitude as that of cerebrospinal fluid. A. T. CAMERON

Change of reaction of the medium and lowering of  $p_H$  during digestion *in vitro* of proteins by pancreatic juice. L. HÉDON. *J. physiol. path. gén.* 21, 295-303(1923).—An alk. soln. of protein colored by phenolphthalein is decolorized by pancreatic juice, the change proceeding rapidly at first, and then slowing to a const.  $p_H$  value. A. T. C.

Studies on the physiology of the liver. IV. The effect of total removal of the liver after pancreatectomy on the blood sugar level. F. C. MANN AND T. B. MAGATH. *Arch. Intern. Med.* 31, 797-806(1923); cf. *C. A.* 16, 3687.—"The liver and pancreas were removed (from dogs) at varying intervals in relation to each other. When the 2 glands were removed at the same time, the resulting condition was the same as though only the liver had been removed (cf. *C. A.* 16, 2895). When the liver was removed from 24 to 96 hrs. after pancreatectomy, the blood sugar decreased quickly and the same characteristic symptoms developed as after hepatectomy, but at a higher blood sugar level. The injection of glucose restored the animal to a normal state, but the effect was transitory. The total removal of the pancreas and partial removal of the liver in an animal in which an Eek fistula had been made was followed by only slight or no increase in blood sugar. These expts. prove that the presence of the liver is absolutely necessary for the hyperglycemia following pancreatectomy." I. GREENWALD

A study of the condition of several inorganic constituents of serum by means of ultrafiltration. B. S. NEUHAUSEN AND J. B. PINCUS. *J. Biol. Chem.* 57, 99-106 (1923).—"Analyses of pig sera, their ultrafiltrates and residues, indicate that the Cl, PO<sub>4</sub>, Na and K are totally diffusible. K in human serum likewise seems to be totally diffusible. Ca in pig serum seems to be from 30 to 50% in a non-diffusible form." I. GREENWALD

Nuclein metabolism. I. Adenine nucleotide in human blood. HENRY JACKSON, JR. *J. Biol. Chem.* 57, 121-8(1923).—The filtrate from a picric acid pptn. of blood from a patient with nephritis was treated with UO<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub>. With the aid of a centrifuge, the ppt. was washed 4 times with 80% EtOH, satd. with NaCl, and was then dissolved in 5% (vol.) H<sub>2</sub>SO<sub>4</sub>. A portion was made alk. with NH<sub>4</sub>OH and centrifuged. The addition of Ag-NH<sub>3</sub> soln. to the supernatant liquid produced no ppt., indicating absence of free purines. The remainder of the H<sub>2</sub>SO<sub>4</sub> soln. was heated at 100° for 2 hrs. and then treated with NH<sub>4</sub>OH and centrifuged. The addition of Ag-NH<sub>3</sub> soln. now produced an abundant ppt., from which a picrate, m. 279°, containing 30% N (adenine picrate), was obtained. The filtrate gave only a very slight ppt. with AgNO<sub>3</sub>, indicating absence of other purines. The filtrate from the first Ag ppt. gave the orcin and phloroglucin reactions for pentose. The presence of combined PO<sub>4</sub> in the U ppt. was also proven. Detn. of nucleotide N in blood.—To 30 cc. tungstic acid filtrate in 50 cc. centrifuge tube, add 0.5 cc. 20% UO<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub>, stir and centrifuge. Decant liquid, add another 30 cc. blood filtrate and 0.5 cc. UO<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub>, stir and centrifuge. Wash twice with 5 cc. 0.4%

$\text{NaCl}$ , then add 0.5 cc. 4%  $\text{NaOH}$ , stir well, add 7 cc.  $\text{H}_2\text{O}_2$ , stir again and centrifuge 10 min. Decant and det. N in liquid by micro Kjeldahl. Normal blood contains from 15 to 25 mg. adenine nucleotide (3 to 5 mg.  $\text{N}$ ) per 100 cc. I. GREENWALD

**The presence and determination of adenine nucleotide in human blood.** II. JACKSON, JR. *Proc. Soc. Exptl. Biol. Med.* 20, 178-9 (1922). A method is outlined whereby nucleotides may be detd. in small samples of tungstic acid blood filtrate. A large part of the undetected N, in the filtrate of Folini and Wu is probably adenine nucleotide. C.V.B.

**The effect of therapeutic application of external heat on the acid-base equilibrium of the body.** F. A. CAJORI, C. Y. CROUTER AND RALPH PEMBERTON. *J. Biol. Chem.* 57, 217-33 (1923).  $-\text{CO}_2$  absorption curves have been constructed from the analytical and equilibration data obtained from venous blood drawn before and after 40 min. exposure of the whole body to the heat of an elec. cabinet. In other expts., the  $p_{\text{H}}$  of venous blood was measured directly. As a result of the external heat, the blood becomes more alk.; there is a fall in its total content of  $\text{CO}_2$  and a slight rise in alk. reserve. These changes in the acid-base equil. of the blood cause compensatory changes in the urine and sweat." J. GREENWALD

**The significance of the potassium ion for muscle tonus.** S. M. NEUSCHLOZ. *Klin. Wochschr.* 2, 21-2 (1923). A K-ion deficiency has no effect upon the contraction range of a toad gastrocnemius muscle nor upon its ability to pass into a state of tetanus; but the ability of the muscle to maintain a condition of tonus is impaired. M.H.

**Metabolism physiology of the surviving heart of warm blooded animals.** Felix KLEWITZ. *Klin. Wochschr.* 2, 22-3 (1923). The expts. were carried out on the surviving hearts of 39 rabbits and 12 dogs. The consumption of glucose is not const. There is no relation between the contraction force of the hearts and the consumption of glucose. Powerfully beating hearts, even when glycogen-free, may consume no glucose. Resting hearts may consume considerable glucose. Normal and especially deglycogenated hearts remove nitrogenous substances from the surrounding medium. Some of these nitrogenous substances are retained, apparently for constructive purposes. Creatine and creatinine may or may not be excreted. The latter substances are occasionally excreted by resting hearts. CL C. A. 17, 3049. MILTON HANKE

**Relation between uric acid and allantoin excretion in hybrids of the Dalmatian hound.** HERBERT ONSLOW. *Biochem. J.* 17, 331-40 (1923). In the case of the hybrid Dalmatians the uric acid and allantoin excreted are in relatively the same proportions as in the normal dog. BENJAMIN HARROW

**Effect of a yeast extract on the oxygen consumption of washed frog muscle.** H. F. HOLDEN. *Biochem. J.* 17, 361-3 (1923). If an ext. of yeast, made with boiling water, be aerated for some hrs. at room temp. in contact with some washed frog muscle it loses its power to increase the velocity of  $O_2$  uptake of another prepn. of freshly washed muscle. This suggests that the effects attributed to a "respiratory substance" capable of providing a general stimulus to intracellular oxidative processes are really to be attributed to the collection of oxidizable substances contained in the yeast ext. B. HARROW

**Effect of insulin on the glycogen in the tissues of normal animals.** H. W. DUDLEY AND G. F. MARIAN. *Biochem. J.* 17, 437-8 (1923). The immediate effect of insulin when injected into normal animals is a fall of blood sugar. Recent expts. by D. and others (C. A. 17, 3543) suggest that this disappearance of sugar is not due simply to an increased combustion of carbohydrate, since the output of  $\text{CO}_2$  and the  $O_2$  consumption of normal animals under the influence of insulin both fall rapidly, while the respiratory quotient also falls. D. and M. thought that possibly the effect of insulin was to increase the quantity of glycogen in the liver, as is the case in diabetic (depancreasized) dogs. It was found, however, that the livers of normal animals receiving sufficient insulin to bring them to the stage of convulsions contain very little glycogen. The skeletal muscles also show a disappearance of glycogen. No difference between the fat content of the livers of mice given large doses of insulin and the fat content of the livers of normal mice could be noted. Apparently, then, the effect of insulin is not to cause a conversion of carbohydrate into fat. Further work to det. the fate of the sugar is being carried out. BENJAMIN HARROW

**Vitality of spermatozoa.** W. S. ANDERSON. Kentucky Agr. Exptl. Sta., *Bull.* 239, 36 pp. (1922).—The av. life of the vigorous spermatozoa of 24 specimens of normal horse semen when preserved in sterilized glass test-tubes was 6 hrs. at 22° and 4 hrs. at 38°. The shorter life at 38° was attributed to the rapid multiplication of harmful bacteria. Lab. light had no perceptible effect on their length of life. Direct sunlight at 38° appeared to have a stimulating effect but reduced the period of life to less than 2 hrs. A few spermatozoa lived as long as 50 min. at 46° and over 1 hr. and 40 min. at 0°. The cells were rendered permanently inactive by freezing the semen. The duration of life of sperm cells of roosters, boars and bulls was approx. the same as that of the horse. The

sperm cells were fatally injured by 0.045% HCl,  $H_2SO_4$ ,  $HNO_3$ , AcOH and  $C_6H_5OH$ , 0.0675%  $KMnO_4$ , and 0.5% EtOH. The av.  $p_H$  value of 7 specimens of normal horse semen was  $p_H$  7.31 and of 5 specimen contg. non-motile spermatozoa  $p_H$  7.58. The semen appears to contain a buffer substance. Chem. analyses showed abnormal horse semen to contain more solids and N, and less ash and P than normal semen. Spermatozoa lived for a longer period in the uterus than under lab. conditions. Results of expts. with the spermatozoa of mud snails (*Nassa obsoleta*), hard shell clams (*Venus mercenaria*) and oysters (*Ostrea virginica*) are given. K. D. JACOB

**Calories and vitamins.** B. W. KUNKEL. *Sci. Monthly* 17, 361-72(1923). H. B. L.

A study of the ammonia present in gastric contents following test meals. JACOB ROSENBLUM. *J. Lab. Clin. Med.* 8, 755-6(1923).—The NH<sub>3</sub> of the stomach contents varies from 0.6 mg. per 100 cc. to 4.6 mg., following the Ewald test meal, and has no diagnostic significance. E. R. LONG

**The effect of anoxemia on metabolism.** E. J. SCHNELLER, E. H. BRUNQUIST AND A. S. LOVENHART. *Proc. Am. Soc. Biol. Chem., J. Biol. Chem.* 55, iii(1923).—“Anoxemia steadily maintained for 3-5 days causes an increase in the endogenous N metabolism; induces an increase in the excretion of incompletely degraded metabolites, as shown by the increased elimination of total org. acids; changes the creatine and creatinine ratio, the creatine excretion being much increased and becoming greater in many cases than the creatinine excretion.” A. P. LOTHROP

**The chemical composition of the body fluids of the sea lion.** R. E. SWAIN AND N. W. RAKESTRAW. *Proc. Am. Soc. Biol. Chem., J. Biol. Chem.* 55, iv(1923).—Analyses were made of the blood, pericardial fluid, milk and urine of 10 sea lions (*Eumetopias stelleri*). The total solids of the milk amounted to 50% and the fat content was high, 24.8%. Unusually high values, with wide variations, were found in the total, non-protein and amino-acid N and urea in the blood. The total amts. of lipoids in the blood and pericardial fluid were extraordinarily high. A remarkable increase in the blood uric acid was apparent in several cases on standing. Uric acid was found in the urine. A. P. LOTHROP

**The relation of fracture healing to the inorganic phosphorus of the blood serum.** WALTER H. EDY AND HATTIE L. HEFT. *Proc. Am. Soc. Biol. Chem., J. Biol. Chem.* 55, xii-xiii(1923).—The bloods of 23 fracture cases were examd., several of them repeatedly; practically all showed an abnormally high P with the progress of healing bearing a definite relation to the amt. of P found. These findings confirm those of Tisdall and Harris (*C. A.* 16, 4263). However the same high P content has been found in the bloods of some 20 cases involving surgical operation and the healing of tissue other than bone. These results cannot be laid to variations in  $CO_2$  capacity and suggest “that we must proceed cautiously before accepting the P findings as a sp. index of bone formation and the desirability of more detailed inquiry into what makes the increase.” Exception is taken to the normal P value given by Tisdall and Harris; E. and H. believe that this figure is approx. 2.9 mg. per 100 cc. of serum. A. P. LOTHROP

**The phosphorus and calcium concentration of the serum of patients during the period of fracture union.** J. J. MOORHEAD, H. W. SCHMITZ, LOIS CUTTER AND V. C. MYERS. *Proc. Am. Soc. Biol. Chem., J. Biol. Chem.* 55, xiii-xiv(1923); cf. preceding abstr.—The av. inorg. P found in 30 normal adults was 3.7 mg. per 100 cc. This has been generally found to increase following fracture but in a series of 30 cases a rise to 5 mg. or more was observed in rather less than half the cases. The highest values are sometimes observed in 2-3 days after fracture and at other times not until a month has elapsed. Union has been observed with practically no increase in the P content and non-union with a high figure. A series of 9 cases of minor fractures of the fingers discloses negative results. Several cases showed slight variations in the Ca paralleling the P. A. P. LOTHROP

**The nature of the carbohydrate of normal urine.** ISIDOR GREENWALD. *Proc. Am. Soc. Biol. Chem., J. Biol. Chem.* 55, xiv-v(1923).—“The excretion of sugar in the urine of a man and of a dog was as high on a protein-fat diet furnishing an adequate amt. of energy as it was on a carbohydrate diet. The 24-hr. quantity was not increased in the dog by the ingestion of as much as 10 g. of glucose per kg. when the animal was on a carbohydrate diet. When the same quantity was given with a protein-fat diet, there was a slight increase in the quantity of sugar in the urine, the increase being the greater, the larger the amt. of fat in the diet. The man showed an apparently perfect tolerance for 1 g. of glucose per kg. body wt. when on a diet contg. about 50 g. of fat and furnishing about 11 g. of N in the urine. When the fat was increased to about 140 g. per day, there was a slight increase in the amt. of sugar in the urine. On the protein-fat diet about 0.05 g. of glucose per kg. of body wt. appeared in the urine. The excretion of sugar was

not affected by the ingestion of 12 g. of thymus or yeast nucleic acid by the man." Lactosazone has been obtained from mixed normal human urine and also another osazone, probably a pentosazone, as pentose was demonstrated in other ways to constitute about  $\frac{1}{4}$  of the total sugar. An osazone sol. in boiling H<sub>2</sub>O and melting at about 200° was also isolated but it appeared to be a mixt. when exaud. microscopically. It is suggested that pentose may be formed from protein and that pentosuria is a disorder of protein, not of carbohydrate, metabolism.

A. P. LOTHROP

**Effect of food ingestion on the clotting time of the blood.** C. A. MILLS. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xvii-xix (1923).—"The clotting time of the blood is longest before breakfast in the morning but shows only slight variations at this time on successive days. It shortens 30-40% about an hr. after each meal and 2-3 hrs. later begins to lengthen. Five to 6 hrs. after each meal it will be almost at the same point as on rising in the morning. This clotting time observed before each meal is termed 'basal clotting time.' The effect on the blood seems to depend on the presence of food in the intestine. Whether it is the absorbed material that causes the change cannot be said. Acid or alkali ingestion sufficient to alter markedly the reaction of the urine produces no change in the clotting time." A. P. LITHROP

A. P. LOTHROP

**The synthesis and rate of elimination of hippuric acid in the organism of the rabbit.**  
 H. B. LEWIN AND W. H. GRIFFITH. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, xxii-xxiii(1923).—"Hippuric acid administered intravenously to rabbits was almost quantitatively eliminated in 6 hrs., while after intravenous injection of an equiv. amt. of BzONa, less than 50% was eliminated as hippuric acid in a like period. The rate of elimination of hippuric acid after enteral ingestion of BzONa was not markedly different from that obtained after intravenous injection. However, when glycocoll was administered with BzONa *per os*, the rate of hippuric acid elimination was greatly increased. Since alanine fed with the benzoate did not increase the rate of hippuric acid elimination, the effect is not considered to be due to stimulation of general metabolism as a result of the specific dynamic action of amino acids. Since the rate of elimination of hippuric acid was accelerated when BzONa was injected *intravenously* and the glycocoll *fed*, the results cannot hardly be explained on the basis of an increased velocity of absorption of the benzoate from the intestine. It seems probable that an increase in the rate of synthesis has resulted from the presence in the system of extra glycocoll or its metabolites and that such glycocoll precursors are not furnished by alanine." A. P. LOTHROP

A. P. LOTHROP

The enzymes of the red blood corpuscles of the mammal. Withrow Morse, Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xxvii-xxviii (1923).—The blood of the dog, in addition to the absence of protoclastic enzyme capable of digesting the tissues of the corpuscles contg. hemoglobin, shows absence of amylase, esterase, and invertase but positive findings were obtained for lipase and catalase. No difference was found in the enzyme content of the blood of *Cryptobranchus alleganiensis*, a salamander having nucleated corpuscles. A. P. Lothrop, M.D.

A. P. LOTHROP

The demonstration of an insulin-like substance in the tissues of the clam (*Mya arenaria*). J. B. COLLIP. Proc. Am. Soc. Biol. Chem., *J. Biol.* 35, xxix(1923). Ext. were prep'd. from clam tissue by the method developed for the isolation of insulin from ox pancreas. In 1 expt. an ext. so prep'd. produced typical convulsions in a normal rabbit in 6 hrs. with a blood sugar content at this time of 0.045%. The convolution was relieved by subcutaneous injection of dextrose. Later exts. made from clam tissue by a modified method produced a marked hypoglycemia only on the 2nd or 3rd day following administration and in certain instances an actual hyperglycemia was noted for a few hrs. following the injection. The clam was chosen for investigation on account of its high glycogen content. A. P. LOTHROP

A. P. LOTHRON

**Studies on the metabolism in pregnancy. I. Changes in the tension of alveolar carbon dioxide.** A. W. ROWE. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xxviii-xxix (1923).—In normal pregnancy there is a marked lowering of the tension of alveolar CO<sub>2</sub> comparable to that observed in well defined ketosis. In 56 normal cases carried to term with 310 observations the av. alveolar CO<sub>2</sub> tension was 32.6 mm. A. P. L.

**Nitrogen distribution in the blood and urine of the alligator.** ALBERT HOPPING AND E. L. SCOTT. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.*, 55, xxxii(1923). Alligator blood contains 1.8-2.6 mg. of uric acid per 100 cc., about the same value as for human blood. In the urine 10-20% of the total N is represented by uric acid and this is evidently not the main end-product of the N metabolism in these reptiles.  $\text{NH}_3$  N varied from 53 to 80% of the total N. In one alligator the total N was 215 mg.; the  $\text{NH}_3\text{-N}$  171 mg. (79%), urea N 7 mg. (3%) and uric acid N 40 mg. (18%) per 100 cc.

In the alligator the cloacal chamber is sepd. by a sphincter from the intestine and fulfills

the function of a bladder; it is possible that decompn. of nitrogenous waste products may occur here. A. P. LOTHROP

**The physiology of the liver. V.** The hepatic factor in chloroform and phosphorus poisoning. C. S. WILLIAMSON AND F. C. MANN. *Am. J. Physiol.* 65, 267-76(1923).—CHCl<sub>3</sub> and P, which seem more or less specifically to injure the liver, do not produce the same changes in the compn. of the blood (*viz.*, decreased dextrose and appearance of uric acid in dogs) as follow the extirpation of the liver. The poisons, while greatly injuring the functions of the liver, do not produce complete hepatic insufficiency except possibly in a very small number of instances. Other tissues and organs are undoubtedly profoundly affected. Conclusions with regard to liver function based on the action of such poisons as CHCl<sub>3</sub> or P must be very cautiously drawn. J. F. LYMAN

**The effect of quinine on the iodine content of the thyroid gland.** H. SUGATA. *Am. J. Physiol.* 65, 282-6(1923).—Quinine sulfate administered to dogs (fasting or fed) in daily doses of 0.2 to 0.3 g. per kg. caused a considerable increase in the I content and concn. of the thyroid. High external temp. (35°) also causes an increase in I, while a decrease is produced by starvation. It is believed that endogenous protein metabolism is fundamentally responsible for the distribution of I in the body. J. F. LYMAN

**Amylase content of the urine and blood.** Y. MASUMIDU. *J. Tohoku Med. Soc.* 6, No. 5(1923); *Japan Med. World* 3, 194.—After the administration of amylase there was a quant. increase of amylase in the urine. After the ingestion of diastase there was more diastase in the urine than after the ingestion of pancreatin. Administration of amylase did not increase the amylase content of the blood. The administration of pancreatin caused a slight increase in blood sugar content. M. E. MAVER

**Ion distribution in serum.** P. RONA and H. PETOW. *Biochem. Z.* 137, 350-63 (1923).—On dialysis of serum at various H-ion concns. Cl<sup>-</sup>, Na<sup>+</sup> and Ca<sup>++</sup> are distributed in accordance with the Donnan equil. K<sup>+</sup> is not. This indicates that K<sup>+</sup> is not bound to the protein as a salt, merely, but in more complex union. When conditions are such that the protein binds more Ca<sup>++</sup>, less K<sup>+</sup> is bound, and *vice versa*, perhaps this explains the antagonism of these ions. GEORGE ERIC SIMPSON

**The physiology of glands.** LEON ASHER. LVI. The effect of the spleen on acetoneuria in dogs, a contribution on the relation between spleen and liver. ERNEST GUTKNECHT. *Biochem. Z.* 137, 439-49(1923); cf. *C. A.* 17, 1050.—After splenectomy less acetone "bodies" were excreted by 2 dogs fed a diet of protein plus fat, than before splenectomy. This is regarded as evidence of an "activating influence" of the spleen on liver function. GEORGE ERIC SIMPSON

**The relation between internal and external secretion. II. The effect of some hormones and proteinogenous amines on the bile-secreting function of the liver.** D. ALPERN. *Biochem. Z.* 137, 507-16(1923); cf. *C. A.* 17, 3534.—Histamine (0.05-0.2 mg. per kg. subcutaneously) increased bile flow. Thyroidin was without effect. Tyramine (up to 0.03 g. per kg.) caused diminished flow; 0.01 g. per kg. did not counteract the effect of 0.0001 g. per kg. of histamine. Atropine (0.001 g. per kg.) diminished secretion and inhibited the effect of histamine. Pituitrin (0.05-0.01 g. per kg. intravenously) caused slightly diminished flow. GEORGE E. SIMPSON

**The retention of potent thyroid material in the animal organism.** J. ABELIN. *Biochem. Z.* 138, 169-75(1923).—White rats were fed large amt. of thyroid tablets for a week. No I was found in the livers of these rats, nor did any of the tissues, when fed to frog larvae, hasten metamorphosis. GEORGE ERIC SIMPSON

**Antagonistic growth principles of serum and their relation to old age.** ALEXIS CARREL AND ALBERT H. EBELING. *J. Exptl. Med.* 38, 419-25(1923); cf. *C. A.* 17, 2137.—The inhibiting action of homologous fibroblasts of the heated serum of a young animal increases relatively more than that of an old animal. After it has been heated, the inhibiting action of the serum of the old animal is still greater than that of the young animal. The CO<sub>2</sub> ppt. obtained from the serum of young animal definitely increases the proliferative activity of homologous fibroblasts, while the CO<sub>2</sub> ppt. of the serum of an old animal has practically no activating power. After the removal of the CO<sub>2</sub> ppt., the inhibiting action of the serum of young animals is increased, while that of old animals is not modified. The increased inhibiting action of serum on homologous fibroblasts in old age is partly due to the disappearance of the growth-activating substance and to the enhanced activity of the growth-inhibiting principle. C. J. WEST

## G—PATHOLOGY

H. GIDEON WELLS

Biochemical properties of the blood of pigeons in polyneuritis and starvation.

**L. S. PALMER AND C. T. HOFFMAN.** *Proc. Soc. Exptl. Biol. Med.* 20, 118-9 (1922). A study of the total solids, protein and non-protein N constituents and cells of the blood of pigeons in various stages and combinations of polyneuritis and starvation indicated that the decrease of the above constituents in polyneuritis is due to the self-imposed starvation found in the late stages of this disease. C. V. B.

**A case of hypoglycemia in a thyroidectomized sheep.** A. BOHANSKY, S. SIMPSON AND S. GOLDBERG. *Proc. Soc. Exptl. Biol. Med.* 20, 195-6 (1922). Normal sheep had 60-8 mg. sugar per 100 cc. of blood; thyroidectomized sheep had 51.7 mg. One thyroidectomized sheep had 76 mg.; thyroxin caused a hyperglycemia of 83 mg. by the 3rd day, followed by a marked drop to 53-71 mg. The adrenal glands were hyperemic and hemorrhagic and weighed 4.91 and 5.22 g. as compared with the normal of 1.5-2 g. The pancreas was normal. Myxedema was marked. C. V. BAILEY

**Disorders of growth.** H. THURSFIELD. *Brit. Med. J.* 1923, I, 841-3.—A general lecture dealing with vitamin and internal secretion deficiencies. A. T. CAMERON

**Influence of insulin upon acidosis and lipemia in diabetes.** H. W. DAVIES, C. G. LAMBIE, D. M. LYON, J. MEAKINS AND W. ROUSON. *Brit. Med. J.* 1923, I, 847-9. Details of 4 cases selected as examples are given, and the results indicate that insulin and carbohydrates given together in sufficient amounts to patients with diabetes verging on coma have a most beneficial effect, there being rapid disappearance of lipemia and ketone compds. from the blood, and return to normal of the bicarbonate reserve. Reduction of the blood sugar is not always accompanied by such an increase of the respiratory quotient as might be expected if the sugar were burned. It is suggested that this may be accounted for by retention of  $\text{CO}_2$  by the liberated alkali on disappearance of ketones from the blood. A. T. CAMERON

**Pathogenesis of rickets.** E. PRITCHARD. *Brit. Med. J.* 1923, I, 887-9. A review in which the conclusion is drawn that the true cause of rickets is most probably a relative excess of acid substances produced in the system by a disproportion between the energy intake and output. Cf. *C. A.* 17, 1497. A. T. CAMERON

**Note on the nature of blood sugar.** L. B. WINTER AND W. SMITH. *Brit. Med. J.* 1923, I, 894-5.—Results show that there is definite evidence that a reactive sugar is present in the blood. There is no chem. evidence that  $\gamma$ -glucose is formed in the body. There is no definite evidence that some of the blood sugar of diabetics is fundamentally different from that of normal persons, but there is at present no evidence that the intestine plays an essential part in the causation of the difference. Cf. *C. A.* 17, 2736. A. T. CAMERON

**"Defatting" of the acid-fast bacilli of leprosy and tubercle by injections of chaulmoogra and morrhuate.** SIR L. ROGERS. *Brit. Med. J.* 1923, II, 11. In 3 untreated nodular leprosy blood lipases averaged an equiv. of 0.035 cc. 0.1 N NaOH, while the av. of 9 cases treated by chaulmoogra and morrhuate injections was 0.22, about normal. This class of prepn. probably acts by increasing the blood lipase, which dissolves the fatty coating of the acid-fast bacilli of leprosy (and probably also of tubercle), setting free the antigen with resulting production of immunity. A. T. CAMERON

**Diabetes and insulin.** SIR THOMAS HORDER, F. G. BANTING, P. J. CAMMIDGE, et al. *Brit. Med. J.* 1923, II, 175-6, 448-51.—A discussion chiefly from the clinical standpoint. A. T. CAMERON

**The early diagnosis of cancer in the stomach by means of gastric analysis.** T. I. BENNETT. *Brit. Med. J.* 1923, II, 275-7.—If the patient be prep'd. overnight by giving finely divided C in milk, contents of the fasting stomach show in almost all cases of gastric carcinoma evidence either of stagnation or of hemorrhage with aberrant secretion, shown either by the presence of C, or of foul odor, lactic acid, or acids other than HCl. A. T. CAMERON

**Action of alcoholic extract of pancreas (insulin) on critical glucemia.** H. CHABANIER, C. LOBO-ONELL AND M. LEBERT. *Bull. soc. chim. biol.* 5, 389-97 (1923). See *C. A.* 17, 2318. A. T. CAMERON

**Lipodиuresis in man.** J. A. SICARD, R. FABRE AND G. FORESTIER. *Bull. soc. chim. biol.* 5, 413-25 (1923).—See *C. A.* 17, 2309. A. T. CAMERON

**Dietetic treatment in diabetes mellitus.** W. R. CAMPBELL. *Can. Med. Assoc. J.* 13, 487-92 (1923).—A general account, in which the necessity of dietetic treatment along with insulin treatment is emphasized. A. T. CAMERON

**Pellagra in Ontario with report of two cases.** G. H. STEVENSON. *Can. Med. Assoc. J.* 13, 504-7 (1923).—Two fatal cases in which no definite diet deficiency was demonstrated, though in both cases the diet had been meager. A. T. CAMERON

**Observations with insulin on Department of Soldiers' Civil Re-establishment diabetics.** J. A. GILCHRIST, C. H. BEST, AND F. G. BANTING. *Can. Med. Assoc. J.*

13, 565-72(1923).—Details of a number of cases with the usual beneficial results.

A. T. CAMERON

**Protein hypersensitivity and its relation to disease.** A. T. HENDERSON. *Can. Med. Assoc. J.* 13, 591-600(1923).—A survey.

A. T. CAMERON

**Routine findings in the psychoneuroses.** B. S. LEVINE. *J. Nervous Mental Dis.* 58, 207-8(1923).—A survey of routine results of 335 cases grouped according to condition. It is considered that a parallelism exists between the differences in the urinary findings and the descriptive psychic and behavioristic differences upon which the classification of the cases is based.

A. T. CAMERON

**Metabolic states contributing to uremia.** N. B. FOSTER. *Arch. Neurol. Psychiatry* 9, 627-32(1923).—A general discussion.

A. T. CAMERON

**Xanthochromia and increased protein in the spinal fluids above tumors of the cauda equina.** H. CUSHING AND J. B. AVER. *Arch. Neurol. Psychiatry* 10, 167-93(1923).—Five cases all gave these findings in the practical absence of nucleated cells.

A. T. CAMERON

**Enlarged liver with persistent acetonuria and diaceturia.** C. WORSTER-DROUGHT. *Proc. Roy. Soc. Med.* 16, Sect. Dis. Children, 56-60(1923).—A girl of 10 with enlarged liver has shown persistent acetone and diacetic acid present in urine (and acetone in breath) for 2.5 yrs., with no sugar or albumin in urine, no jaundice, and negative fructose hepatic efficiency tests.

A. T. CAMERON

**An electrochemical interpretation of shock and exhaustion.** G. W. CRILE. *Surgery, Gynecology and Obstetrics* 37, 342-52(1923).—A theoretical paper.

A. T. CAMERON

**The clinical significance of abnormalities in urine volume.** T. ADDIS. *Arch. Intern. Med.* 31, 783-96(1923).—In a series of expts. on 28 normal individuals, detns. were made of the total 24-hr. vol. of urine on a const. diet, of the night vol. and urea excretion after restriction of fluid intake, with and without ingestion of urea, of the hourly excretion of urine after the ingestion of urea and large vols. of H<sub>2</sub>O and of the fraction of the 24-hr. vol. and urea excreted during the night in periods of high and low H<sub>2</sub>O ingestion. The results were treated statistically and definitions of polyuria, oliguria and nycturia were derived in this manner. Abnormalities of urine vol. due to renal causes are characterized by too large vols. when fluid intake is restricted and too low vols. when the fluid intake is large, so that the quotient obtained by dividing the hourly urine vol. in periods of large fluid intake by the hourly vol. in periods of low fluid intake is less than normal. When extra-renal causes are operative, this quotient remains normal.

I. GREENWALD

**Observations on the blood gases in auricular fibrillation and after the restoration of the normal mechanism.** H. J. STEWART. *Arch. Intern. Med.* 31, 871-93(1923).—A study was made of the gases of the blood of 15 patients with auricular fibrillation, 14 of whom received quinidine and in 12 of whom normal mechanism was reestablished. Complete studies were made in 9 cases. In 7 of these, there was a definite increase in venous O<sub>2</sub> satn. and a diminution in the coeff. of utilization (difference of vols. % O<sub>2</sub> between arterial and venous blood) with the onset of normal mechanism. The other 2 cases showed the same effect somewhat later. The effect is believed to be due to the improvement in the circulation. A reduction in the arterial O<sub>2</sub> satn. with the onset of normal mechanism, followed by a later increase to normal, was regularly observed, except in 2 cases with emphysema. The effect is ascribed to improvement of the circulation, with subsequent compensation. In 3 cases with a high O<sub>2</sub> capacity and in 2 others with a lower O<sub>2</sub> capacity, this was lowered after the onset of normal mechanism. The high hemoglobin content may have been a compensatory mechanism. In 6 cases with low or normal O<sub>2</sub> capacity, this was increased under normal mechanism. The changes in CO<sub>2</sub> content were variable. The vital capacity was uniformly increased.

I. GREENWALD

**Experimental uranium nephritis. A chemical and pathologic study.** F. R. NUZUM AND L. L. ROTHSCHILD. *Arch. Intern. Med.* 31, 894-909(1923).—Various stages of nephritis were produced in rabbits by the injection of UO<sub>4</sub>(NO<sub>3</sub>)<sub>2</sub>. Large single doses produced an extreme degeneration of the cells lining the convoluted tubules and the loops of Henle. Repeated doses over a long period produced a chronic diffuse nephritis, comparable to chronic diffuse nephritis in man. After repeated injection as much as 17 mg. UO<sub>4</sub>(NO<sub>3</sub>)<sub>2</sub> per kg. may be given. The initial injections were followed by a sharp rise in non-protein N and urea in the blood but, after a chronic nephritis had been established, even large doses had no further effect. The logs. of the urine vol., total N, urea, uric acid and creatinine varied in a similar manner, but the abs. amts. of uric acid and of creatinine showed less variation from the normal than did the amts. of the other constituents. The increases in the non-protein N and urea of the blood were

parallel. The first effect observed was a lowering of the  $\text{CO}_2$  capacity of the plasma and the magnitude of this effect was proportional to the extent of cell destruction in the kidney.

I. GREENWALD

**Studies on the potassium content of human serum.** LAWSON WILKINS AND BENJAMIN KRAMER. *Arch. Intern. Med.* 31, 916-22 (1923).—Normal human serum contains 18-22 mg. K per 100 cc. Increases were observed only in nephritis (27.6 mg.) and in tetany (23.9 mg.). There was no apparent relation between increased K and decreased Ca. The ingestion of 1.3 g. KI, 3 times a day for a long time, did not increase the K content of the serum but, after the ingestion of 2, 10 and 15 g. KCl, the K content of the serum was increased to 25, 30 and 35 mg., resp., in about 2 hrs., with subsequent return to normal.

I. GREENWALD

**Blood concentration changes in extensive superficial burns, and their significance for systematic treatment.** F. P. UNDERHILL, G. L. CARRINGTON, ROBERT KAPSNOW AND G. T. PACK. *Arch. Intern. Med.* 32, 31-49 (1923).—In extensive superficial burns the blood becomes highly concd. and this increased concn. is regarded as an important factor in the development of many of the symptoms. Restoration of normal blood concn. by adequate forcing of fluids is accompanied by marked evidences of improvement and the development of the usual sequelae is checked.

I. GREENWALD

**Three fatal adult cases of malabsorption of fat, with emaciation and anemia, and in two acidosis and tetany.** H. L. BLUMGART. *Arch. Intern. Med.* 32, 113-28 (1923).—Chiefly clinical.

I. GREENWALD

**Chylous and pseudochylous effusions. A report of seven cases.** M. A. BLANKENHORN. *Arch. Intern. Med.* 32, 129-39 (1923).—The causes of turbidity in milky ascitic fluids. *Ibid* 140-56.—So-called pseudochylous fluids may contain as much fat as those classed as chylous, but the fat is more finely divided.

I. GREENWALD

**Water intoxication.** L. G. ROWNTREE. *Arch. Intern. Med.* 32, 157-74 (1923).—See *C. A.* 16, 2922.

I. GREENWALD

**The relationship of excess of uric acid in the blood to eczema and allied dermatoses. Based on an analysis of over 200 cases.** J. F. SCHAMBERG AND H. BROWN. *Arch. Intern. Med.* 32, 203-21 (1923).—Over  $\frac{1}{4}$  the patients had eczema and in 50% of these the uric acid content of the blood was greater than the max. normal (3.5 mg. per 100 cc.). High values were also obtained in some cases of pruritus. The higher uric acid figures were obtained in patients more than 40 yrs. old. The figures for men were about 25% higher than those for women. Appropriate dietary measures have made the patients more amenable to treatment.

I. GREENWALD

**Sensitization tests with digestive products of protein.** I. C. WALKER, A. S. WETMORE AND JUNE ADKINSON. *Arch. Intern. Med.* 32, 323-34 (1923).—Patients sensitive to proteins were tested with the products of the digestion of these proteins by pepsin and trypsin, with and without the addition of various bacteria. No reaction was obtained whenever the digestion had proceeded far enough to ensure the absence of any unchanged protein.

I. GREENWALD

**Blood sugar reaction following intravenous injection of glucose.** L. G. RIGLER AND H. L. ULRICH. *Arch. Intern. Med.* 32, 343-52 (1923).—The intravenous injection of glucose is a simple and harmless procedure and detns. of the concn. of sugar in the blood at intervals thereafter should yield more accurate information regarding glucose tolerance than similar detns. made after the ingestion of glucose. Thirty min. after the injection of 0.33 g. glucose per kg. in 20% soln. in 10 min., the concn. of glucose in the blood of 7 non-diabetics varied from 136 to 182 mg. per 100 cc. and in the blood of 3 diabetics from 238 to 488 mg. Two hrs. after the injection, the values were 72 to 94 and 164 to 465 mg., resp.

I. GREENWALD

**Studies on liver function. Rose bengal elimination from the blood as influenced by liver injury.** G. D. DELPRAT. *Arch. Intern. Med.* 32, 401-10 (1923).—Rose bengal (tetraiodotetramethylrofluorescene), when injected into the circulation of normal dogs, in doses of 1 mg. per lb., remains in the blood stream for at least 10 min. and for a considerably longer period after injury to the liver by  $\text{CHCl}_3$ .

I. GREENWALD

**Toxic nephritis in pyloric and duodenal obstruction. Renal insufficiency complicating gastric tetany.** G. E. BROWN, G. B. EUSTERMANN, H. R. HARTMAN AND L. G. ROWNTREE. *Arch. Intern. Med.* 32, 425-55 (1923).—A report of 11 cases, in which as the result of org. obstruction, anatomic or physiologic stasis in the duodenum, duodenal toxemia developed. This was characterized by the vomiting of large amt. of a thin serous, bile-stained fluid, evidences of dehydration (red, florid complexion, high hemoglobin, low blood pressure and asthenia) by tetany-like manifestations and features of shock and uremia. The Cl of the blood fell to a min. of 240 mg. NaCl per 100 cc.; the  $\text{CO}_2$ -combining capacity rose to a max. of 165 vols. %, the urea and creatinine rose

to a max. of 255 and 6 mg., resp., per 100 cc. The phenolsulfonephthalein excretion was lessened and the urines contained albumin and casts. Necropsy in 6 cases showed acute degenerative changes in the tubular epithelium or a diffuse nephritis.

I. GREENWALD

**Alkalosis versus abnormal sodium ion concentration as a cause of tetany.** W. DENIS AND L. VON MEYSENBUG. *J. Biol. Chem.* 57, 47-63(1923); cf. Greenwald, *C. A.* 17, 139.—Intravenous injections of  $\text{NaHCO}_3$ ,  $\text{NaCl}$  and of  $\text{Na}_2\text{SO}_4$  into dogs anesthetized with  $\text{Et}_2\text{O}$  all produced convulsive movements of limbs at approx. the same increased concn. of  $\text{Na}$  and decreased concn. of  $\text{Ca}$  in the serum. The injection of  $\text{NaHCO}_3$  produced a change of  $p_{\text{H}}$  from 7.4 to 7.6, with increase of  $\text{CO}_2$  content, whereas the injection of  $\text{NaCl}$  or of  $\text{Na}_2\text{SO}_4$  was followed by a decrease in  $\text{CO}_2$  content and a change in  $p_{\text{H}}$  from 7.4 to 7.28 in the one expt. ( $\text{Na}_2\text{SO}_4$ ) in which this was detd. The elec. excitability was increased after injections of  $\text{NaHCO}_3$  but diminished after injections of  $\text{NaCl}$  or of  $\text{Na}_2\text{SO}_4$ . D. and von M. regard this electric hyperexcitability as an essential element in tetany and believe that their results "make it seem improbable that the spasmophilic conditions following excessive  $\text{NaHCO}_3$  injection are due to 'sodium poisoning,' but rather to an abnormal  $\text{H}_2\text{CO}_3 : \text{NaHCO}_3$  ratio." I. GREENWALD

**Studies of the thyroid apparatus. XVII. The effect of thyroparathyroidectomy and parathyroidectomy at one hundred days of age on the calcium, magnesium and phosphorus content of the ash of the humerus and femur of male and female albino rats.** F. S. HAMMETT. *J. Biol. Chem.* 57, 285-303(1923).—In normal rats, both femur and humerus increase in Ca, Mg and P content during the period from 100 to 150 days of age, quite uniformly in the sexes. After thyroparathyroidectomy, the bones of rats of both sexes contained less ash than those of normal rats and the ash contained more Mg and P. This effect was even more marked after parathyroidectomy alone. In female rats after thyroparathyroidectomy the ash also contained less Ca than did the ash of the bones of normal rats. This effect was, similarly, more marked after parathyroidectomy than after thyroparathyroidectomy. I. GREENWALD

**The balance of anions and cations in the plasma in nephritis.** JOHN MARRACK. *Biochem. J.* 17, 240-50(1923).—The plasma  $\text{HPO}_4^{2-}$  was increased in the majority of cases with high blood urea. Na was not increased in the plasma even in extreme degree of renal insufficiency. Evidence is given of a disturbance in the distribution of chlorides between the plasma on the one hand and cerebrospinal fluid and tissues on the other. The excess of cation in normal plasma unaccounted for by  $\text{HCO}_3^-$ ,  $\text{Cl}^-$  and  $\text{HPO}_4^{2-}$  is combined mainly with protein. In many cases of nephritis with much urea retention an excess of cation over and above that combined with  $\text{HCO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{HPO}_4^{2-}$  and protein was found. The  $p_{\text{H}}$  of the majority of cases was around 7.4. In most cases of acidosis in nephritis the reduction of plasma  $\text{HCO}_3^-$  was due to accumulated  $\text{HPO}_4^{2-}$  and undetd. anions. Dyspnea in nephritis is not caused by acidosis but by disturbances of the circulation and the respiration.

BENJAMIN HARROW

**Hydrogen-ion concentration of the blood in certain pathological conditions, as determined by the hydrogen electrode and the indirect methods of Barcroft and Hasselbach.** T. R. PARSONS AND E. P. POULTON. *Biochem. J.* 17, 341-60(1923).—In cardio-renal disease and mitral disease with heart failure the log. K at  $p_{\text{H}} 7.4$  tended to be rather low. It was rather higher in a few cases of diabetes with ketosis. A case of erythremia with splenomegaly, treated for 5 days in an O chamber, showed no alteration in the blood picture. There was a marked diminution in the fixed acid of the blood, which was previously abnormally high. In cases of diabetes with ketosis, in mitral disease with pregnancy, in uremia and renal disease and erythremia, the  $p_{\text{H}}$  observed at 40 mm. was abnormally low. The buffer value of the blood is diminished as the fixed acid in blood is increased.

BENJAMIN HARROW

**Use of yeast extracts in diabetes.** L. B. WINTER AND W. SMITH. *Nature* 112, 205(1923); cf. *C. A.* 17, 3050; Collip, *C. A.* 17, 2715.—The authors have obtained from the action of microorganisms other than yeast, exts. which have a very considerable power of lowering the blood sugar of normal animals to a point where convulsions occur. That the convulsions were not due to a toxic effect is shown by the fact that they were relieved by injection of glucose.

BENJAMIN HARROW

**Hemoclastic crisis in a case of asthma.** L. CONTI AND L. VILLA. *Arch. sci. med.* 45, 229-40(1922, publ. in 1923).—Urobilinuria was produced artificially by exposure of the patient to cold.

M. HEIDELBERGER

**Serum of normal pigeons and of those treated with antigens.** G. PETRAGNANI. *Rend. d. adunanza dell' accad. med.-fis. fiorentina; Sperimentale* 77, 105-8(1923).—The serum of pigeons contains neither complement nor "complementoids." The hemolytic action of pigeon serum on rabbit red cells, when inhibited by heat or long

**storage, cannot be restored by addition of fresh guinea-pig serum, showing the action to be due to a specific hemotoxin.** M. HEIDELBERGER, *Arch.*

**Cholesterol metabolism in pregnancy and after childbirth.** E. E. PРИБАНЕК. *Gynakol.* 119, 56-68(1923).—A lipid retention develops early in pregnancy with an increase of cholesterol in the blood and usually a decrease of cholesterol in the bile. After childbirth there is an elimination of cholesterol from the blood and an increase of cholesterol in the bile with a thickening of the bile both in the liver and in the gall bladder. The bile from the gall bladder has 2 or 3 times as much dry residue as the bile from the liver and its cholesterol content is greater but the degree of thickening of the bile does not parallel its cholesterol content. The increased concn. of the bile after childbirth combined with the increased elimination of cholesterol may be the cause of the disturbances of the gall bladder and formation of gallstones often noted after childbirth. HARRIET F. HOLMES

**The antitoxic action of serum on placenta toxin.** TASHIRO HAYASHI. *Arch. Gynakol.* 119, 29-50(1923).—Human blood serum loses its power to neutralize placenta toxin on standing both at room temp. or in the ice chest and also when heated to 60°. The substance which neutralizes the placenta toxin does not pass through an Abderhalden membrane and is contained in the fluid of the dialyzed serum and not in the sediment. It is not identical with hemolytic complement. HARRIET F. HOLMES

**The nature of eclampsia.** ISEI OBATA. *Arch. Gynakol.* 119, 69-79(1923).—The causal factor in eclampsia is an intoxication by placenta toxin due to a loss of the power of the blood serum to neutralize this toxin. Exptl. work on rabbits showed that this power of the serum to neutralize placenta toxin is not altered by partial or total extirpation of kidneys, ovaries, spleen, thyroid or adrenals, but is markedly lessened when liver degeneration has been induced by the injection of P. As liver degeneration is a common finding in eclampsia the loss of power of the serum of eclamptics to neutralize placenta ext. may be attributed to a functional disturbance of the degenerated liver. HARRIET F. HOLMES

**The adrenaline content of the blood in normal individuals, in patients with Addison's disease and in cases of vascular hypertony.** P. HOGLER. *Wiener Arch. inn. Med.* 6, 343-54(1923).—Adrenaline is not an excretion but an internal secretion and as such is an important factor for the regulation of blood pressure and blood sugar. It does not exert a transitory influence on blood pressure in shock or psychic excitement as Cannon maintains, but has a permanent influence on blood pressure. The production of adrenaline is decreased in Addison's disease and increased in vascular hypertony. HARRIET F. HOLMES

**Blood sugar content in eclampsia.** I. OBATA AND T. HAYASHI. *Arch. Gynakol.* 119, 80-96(1923).—*In vitro* certain concns. of grape sugar neutralize the toxic action of placenta exts. while stronger and weaker solns. are without effect. The increase in blood sugar caused by an injection of adrenaline does not alter the antitoxic action of the serum. The serum of rabbits treated with P shows a decrease of blood sugar and its antitoxic action is reduced and this reduction continues when the blood sugar content is increased as a result of muscle cramps after strychnine injection. The serum of diabetics with high blood sugar content shows a decreased antitoxic power. In eclampsia the blood sugar content seems more labile than in normal pregnancy and after attacks may be normal or increased and low at other times. The decrease in antitoxic power of the serum of eclamptics for placenta toxins cannot be related at present to a change in blood sugar content. HARRIET F. HOLMES

**The etiology of rickets: an experimental investigation. II.** D. NOEL PATON AND ALEXANDER WATSON. *Brit. J. Exptl. Pathol.* 4, 177-95(1923).—In work with young dogs the limitation of the supply of Ca proved to be of more importance in detg. the onset of rickets than the limitation of vitamin A. A very restricted supply of Ca, although leading to changes in the bones, chemically and structurally resembling those found in rickets, did not materially reduce the Ca of the blood and muscles or the inorg. P content of the blood. The retention of P appeared to be detd. by the retention of the Ca. The % of Ca retained did not vary very considerably with the amt. in the food. The addn. of olive oil to a diet which was adequate to prevent rickets actually favored its onset. This can hardly be explained by deficiency of the oil in some antirachitic substance. Cod-liver oil exercised a marked effect in favoring the cure of rickets. The addn. of feces from cases of infantile rickets to the diets of pups was not followed by a development of rickets and the injection of blood from cases of active infantile rickets did not produce the condition. HARRIET F. HOLMES

**Experiments on the respiration of malignant tissues.** GUNNAR AHLGREN. *Brit. J. Exptl. Pathol.* 4, 196-204(1923).—When studying tumor respiration the H-ion concn.

should be maintained at the normal blood reaction by a sufficiently powerful buffer substance, preferably by  $K_2PO_4$ . To est. the respiration intensity there must be a sufficient quantity present not only of O (or of some other H acceptor), but also of a combustible matter, this being consumed without replacement when the tissue is removed from the organism. This is suitably done by adding succinic acid or glycerophosphoric acid, or both of them simultaneously.

HARRIET F. HOLMES

**Auto-dissociation of agglutinin-antigen complex.** T. G. M. HINE. *Brit. J. Exptl. Pathol.*, **4**, 231-4 (1923).—Agglutinin, after absorption by staphylococci, dissociates itself from its antigen after standing at normal temp. for a sufficient time. Partial dissociation occurs when normal rabbit serum is substituted for immune serum. Agglutinin seems to be transferable from one immune serum to another, though heterogeneous, immune serum.

HARRIET F. HOLMES

**Water and salt metabolism in tetany.** H. ELIAS, F. KORNFIELD AND E. WEISSBARTH. *Wiener Arch. inn. Med.*, **6**, 283-302 (1923).—A chem. examn. was made of the urine of normal individuals and of tetany patients after the administration by mouth of 250 cc. 0.1 N HCl and again several days later after the administration of an equiv. amt. of NaCl. Normal individuals when quiet excreted more acid and  $NH_3$  after the ingestion of HCl. Bodily movement caused a decrease in acid production after HCl administration. In tetany patients after HCl ingestion less acid and less  $NH_3$  is excreted than by normal individuals and after NaCl ingestion more. A patient with tetany may even eliminate less acid after HCl than after NaCl ingestion. The lessened acid and  $NH_3$  excretion is accompanied by a parallel reduction in the excretion of  $H_2O$ , Cl and P. It is probable that in tetany there is not an isolated disturbance of acid-base equilibrium but a disturbance in the intermediary water and salt metabolism.

HARRIET F. HOLMES

**The clinical importance of the determination of sensitivity to adrenaline.** K. CSÉPAI, B. FORNET AND K. TÓTH. *Wiener Arch. inn. Med.*, **6**, 383-94 (1923).—The sensitivity to adrenaline as indicated by blood pressure dets. may be of considerable diagnostic and prognostic significance. In goiter, Basedow's disease and hyperthyreosis there is an increase in sensitivity to adrenaline injected intravenously, while with simple goiter there is no increase in blood pressure over that shown by normal individuals on adrenaline injection. This simple procedure might well replace the detn. of basal metabolism in such cases. In Addison's disease and diabetes insipidus there was a decreased sensitivity to adrenaline. The subcutaneous injection of adrenaline is also of value as in myxedema as indicating the effect of thyroid administration.

HARRIET F. HOLMES

**The formation of Charcot-Leyden crystals.** ALFRED NEUMANN. *Wiener Arch. inn. Med.*, **6**, 406-22 (1923).—The mother substance of the Charcot-Leyden crystals is produced in the eosinophile cells and only to a limited extent in other cells. It seems to arise from the protoplasm rather than from the nucleus or eosinophile granules. It is formed during coagulation of the blood, and as coagulation proceeds the production of the mother substance increases until the plasma about the cells becomes saturated and then Charcot-Leyden crystals are formed. The mother substance plays an active part in the formation of fibrin and after fibrin is formed, Charcot-Leyden crystals can no longer be demonstrated.

HARRIET F. HOLMES

**The effect produced on diabetes by extracts of pancreas.** F. G. BANTING, C. H. BEST, J. B. COLLIP, W. R. CAMPBELL, A. A. FLETCHER, J. J. R. MACLEOD AND E. C. NOBLE. *Univ. Toronto Physiol. Series*, No. 57, 11 pp. (1923).—Review of work published elsewhere. Cf. *C. A.*, **16**, 3115, 3116.

H. B. LEWIS

**Some relations between hydrogen-ion concentration and the antigenic properties of proteins.** I. S. FALK AND M. F. CAULFIELD. *J. Immunol.*, **8**, 239-65 (1923).—See *C. A.*, **17**, 3052.

E. R. LONG

**Complement-deficient guinea-pig serum.** R. R. HYDE. *J. Immunol.*, **8**, 267-86 (1923).—Certain guinea pigs show a marked deficiency in complement, which is to be attributed to absence of the third (heat resistant or yeast absorbed) component. The deficient serum may be activated for hemolytic tests by the addn. of very small amts. of fresh human, guinea pig, dog, cat or rabbit serum, but not by ox, duck, pig, chicken, pigeon, sheep, frog, goat or mouse serum. Heated human serum is a potent activator. Certain serums have supplied 5000 activating units per cc. The deficient serum is activated *in vivo* on injection of normal guinea pig or human serum, returning to its previous state in 3 or 4 days. Complement-deficient serum is lytic for red corpuscles if large quantities of sensitizing serum are used, the sensitizing serum supplying the missing component. The missing, or third, component has certain properties usually attributed to enzymes. It brings about changes out of all proportion to the amt. involved.

**It has no independent power of reproduction.** The complement deficiency of guinea pigs is not a dietary result. It behaves in heredity as a recessive Mendelian unit, which gives clean-cut segregation from its normal allelomorph. It does not pass through the placenta. It is of autochthonic origin, and its presence is detd. by the genotypical, inherited make-up of the zygote. E. R. LONG

**Studies in specific hypersensitiveness. Relative susceptibility of the American Indian race and the white race to poison ivy.** OLIN DEIBERT, E. F. MENGER and A. M. WIGGLESWORTH. *J. Immunol.* **8**, 287-9(1923).—The American Indian race differs slightly if at all from the white race in susceptibility to poison ivy. E. R. LONG

**The biochemical race-index of Koreans, Manchus and Japanese.** HOZUMI FUKA MACHI. *J. Immunol.* **8**, 291-4(1923).—The blood type of Koreans is quite near the Asia-African. That of the Manchus is Asia-African. There is a marked difference in race index between these types and the Japanese. The index is detd. on the basis of agglutination. E. R. LONG

**Serological reactions in isolated rabbit lungs. I. Reactions to histamine and to Vaughan's protein-split product.** W. H. MANWARING and H. D. MARINO. *J. Immunol.* **8**, 317-21(1923).—A vaso-constriction sufficient to reduce the rate of perfusion 95% is produced by histamine in isolated rabbit lungs. It is associated with marked perivascular edema. A 75% reduction in perfusion flow is produced by Vaughan's protein-split product, with partial or complete recovery in 9 min. E. R. LONG

**The effect of normal meal upon the blood sugar level in health and in certain conditions of disease. A simple food tolerance test.** J. C. BRILL. *J. Lab. Clin. Med.* **8**, 727-31(1923).—In normal individuals blood sugar is nearly const. after the morning meal, but is apt to rise higher than normal after the mid-day meal. Breakfast time will show the greatest contrast between normal and abnormal conditions. For test purposes breakfast should include all the food elements, and should amt. to 100 g. carbohydrate, 26 g. protein, 27 g. fat, and 760 calories. Two estns. are made, fasting and an hr. and a half after breakfast. Normally 1.5 hr. after breakfast blood sugar is within 10 mg. of the fasting level, and the 2 estns. furnish an almost horizontal line. In diabetes the second figure is considerably higher than the first. E. R. LONG

**The swelling capacity of diseased tissue.** WILHELM V. GAZA and HANS WESSEL-Z. ges. expil. Med. **32**, 1-41(1923).—Qual. as well as quant. changes occur in the swelling capacity of tissues in disease, with marked variation in the swelling curve. It is difficult to det. if in different diseases varying curves for sp. ions occur. Variation in swelling capacity from the normal decreases with increasing distance from local lesion. A constitutional disease like diabetes influences the swelling capacity of all mesodermal tissues. Characteristic behavior in swelling is shown by acutely and chronically inflamed tissues, which, in the presence of Na ions on the one hand and Ca and Mg on the other, is the reverse of that displayed by normal tissues. Edematous tissues have a characteristic swelling curve, based on alterations in the physicochemical state of the colloids. E. R. LONG

**The proteolytic action of human serum.** M. SCHIERER. Z. ges. expil. Med. **32**, 142-57(1923).—For the demonstration of proteolytic enzyme in human serum it is advantageous to treat 2 vols. serum with 3 vols. 96% alc., and filter. With the ppt. proteolysis of casein, with liberation of tryptophan, leucine and tyrosine, can often be observed, while it occurs regularly with carmine-fibrin as a substrate. It is especially marked in pneumonia and acute nephritis, moderate in contracted kidney and normal serum, and weak but unmistakable in the serum of the new born. In albuminous urine enzymes digesting casein may be detected by the same method. E. R. L.

**Hydrogen-ion changes accompanying death.** A. E. KOEHLER. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, viii(1923).—A reaction of about  $p_H$  6.7 develops in autolyzing liver pulp in the first few min. after death and does not change subsequently to any marked extent. Similar results were obtained with muscle tissue. In an attempt to eliminate the macerating effect upon the tissue, perfusing the leg of a dog with adjusted Ringer soin. was tried; death resulted in a rapid and marked change of the perfusate from a  $p_H$  of 7.3 before to 6.8 after death. A. P. LOTHROP

**The rise of acidity in autolysis.** WITHROW MORSE. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, viii-ix(1923).—Studies on kidney, spleen and liver tissue from guinea pigs and rabbits showed a depletion of the alkali reserve of these tissues immediately after death. A degree of CO<sub>2</sub>-combining power below that exhibited by the blood plasma of a patient in diabetic coma was found. A. P. LOTHROP

**Iodine in natural waters in relation to goiter.** J. F. McCLENDON. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, xvi-xvii(1923).—"Foodstuffs derive I from the soils,

and river water represents leachings from soils. In the Mississippi River system, in Minnesota, I averages 0.8 per billion and goiter 8 per 1000 troops; in Missouri, I is increased to 2 and goiter reduced to 4. The distribution of Cl and I might show similarity because of similar solv. The U. S. is divided into 4 regions: 1st, goiter 15-30 per 1000 troops and Cl 0.5 to 2% of total dissolved solids in representative rivers; 2nd, goiter 5 to 15 and Cl 1 to 3; 3rd, goiter 1 to 5 and Cl 2 to 5; 4th, goiter 0 to 1 and Cl 4 to 30. Rats fed KI by the author for 2 generations had thyroids averaging half the wt. of those of Jackson's rats fed no I." A. P. LOTHROP

**The benzoate test for renal function.** F. B. KINGSBURY. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xxi-xxii (1923); cf. *C. A.* 15, 3673.—The test is carried out as follows: The subject voids urine and immediately drinks a soln. of 2.4 g. of BzONa in 100 cc. of H<sub>2</sub>O. The container is rinsed with 200 cc. of H<sub>2</sub>O and this is also drunk. At the end of 1 hr. another 200 cc. of H<sub>2</sub>O is drunk. The first specimen of urine is collected 2 hrs. after the ingestion of the BzONa and 1 hr. later a second specimen is collected. The test is made before breakfast and all food is withheld until after the test is completed. The samples are separately analyzed for hippuric acid by the method of Kingsbury and Swanson (*C. A.* 15, 3860). The total excretion of hippuric acid in the first 2 hrs. is normally (44 tests) at least 70% of that theoretically obtainable from 2.4 g. of BzONa and the total for 3 hrs. is at least 90%. The benzoate test indicates impairment of renal function earlier than does the retention of urea in the blood. In well marked nephritis it is always low and the findings agree with the blood urea and phenolsulfonephthalein criteria. A. P. LOTHROP

**The benzoate test for renal function. II.** F. B. KINGSBURY. *Arch. Intern. Med.* 32, 175-87 (1923); cf. preceding abstract.—The benzoate test indicates the impairment of renal function earlier than does the increase in the urea content of the blood, and agrees with the H<sub>2</sub>O excretion test of Volhard and Fahr (Die Brightsche Nierenkrankheit, Berlin, 1914), the urea concn. test of MacLean and de Wesselow (*C. A.* 14, 2818) and the constant of Austin, Stillman and Van Slyke (*C. A.* 15, 2303). No evidence was obtained of the presence of free BzOH in the urine of a man with glomerulonephritis, who died a week after the test was made. Cf. Morgulis, Pratt and Jahr (*C. A.* 17, 822). The use of CHCl<sub>3</sub> by these workers is criticized. I. GREENWALD

**The amino-acid nitrogen in the blood and its possible relation to the elevation of the metabolism in myelogenous leucemia.** K. GANDFORD, W. M. BOOTHBY AND H. Z. GRIFFIN. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xxii-xxiv (1923).—In several cases of myelogenous leucemia an increase in the amino-acid partition of the non-protein N of the blood was found which was accompanied by some, but not necessarily a proportional increase in basal metabolism. In 2 cases, however, there was a distinctly elevated basal metabolism without an increase in the amino acids. In 2 cases of lymphatic leucemia similar results were obtained and in 1 case an increase in both factors was observed. In 21 patients with exophthalmic goiter and 6 with adenomatous goiter with hyperthyroidism there was no elevation of the amino acids or other non-protein nitrogenous substances in the blood. A. P. LOTHROP

**The nephropathic action of mucic acid.** WM. C. ROSE AND PAULINE S. DIMMITT. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xxvii (1923); cf. *C. A.* 16, 3700.—The Na salt of mucic acid administered in doses of 0.5 g. produces a severe nephritis in rabbits accompanied by marked retention of non-protein N, urea, and creatinine and a fall in the phenolsulfonephthalein excretion almost to zero. The kidney lesions involved the tubules primarily with more or less secondary involvement of the glomeruli. Adipic acid on the other hand is only slightly nephropathic. The introduction of OH groups in dicarboxylic acids greatly increases their renal toxicity as tartaric acid has also been found to be more toxic than succinic. Very large doses of mucic acid are required to produce nephritis when the acid is given by mouth. A. P. LOTHROP

**The occurrence of ketone bodies in the urine of normal rabbits in a condition of hypoglycemia following the administration of insulin. A condition of acute acidosis experimentally produced.** J. B. COLLIP. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* 55, xxxviii-xxxix (1923).—Urine obtained from rabbits immediately following the convulsive state induced by insulin gave a decidedly positive Rothena test, showing the presence of acetone bodies. The same reaction was obtained in urines from animals with blood-sugar levels ranging from 0.065 to 0.045%. Quant. estn. of the ketone bodies showed the presence of from 50 to 100 mg. per 100 cc. of urine in samples obtained after the convulsive state has become manifested. In some cases there was also a fall in the CO<sub>2</sub>-combining power of the blood with a value as low as 28 in the convulsive state. In other instances practically no reduction, however, occurred. "It would appear that

while we have in insulin a substance which will correct all the acidotic signs both in exptl. animals rendered diabetic and in patients suffering from diabetes (if the dosage is adequate), it will, nevertheless, produce many of the cardinal symptoms of acidosis when administered to the normal animal in amt. sufficient to produce a hypoglycemia of a marked degree." A. P. LORHROP

**The influence of alkali therapy on ketosis in diabetes mellitus.** H. O. MOSENTHAL AND J. A. KILLIAN. Proc. Am. Soc. Biol. Chem., *J. Biol. Chem.* **55**, xiii(1923). Six diabetic patients were fed a standard diet contg. 30 g. of carbohydrate, 130 g. of fat and 40 g. of protein, giving 1,400 to 1,500 cals.  $\text{NaHCO}_3$  was given by mouth in doses of 30-45 g. per day until it was felt that the max. effect of the alkali had been obtained. The administration of the  $\text{NaHCO}_3$  produced a decrease in the acetone bodies of the blood associated with a rise in the  $\text{CO}_2$ -combining power and a drop in the blood sugar concn. At the beginning of the period of alkali therapy there was an initial rise in the acetone bodies of the urine but subsequently they fell to within normal limits in some cases. There was also a marked decrease in the sugar excretion in the urine. In some cases the effect of the  $\text{NaHCO}_3$  persisted for about 10 days after its administration had been discontinued. A. P. LORHROP

**Pulmonary edema and congestion in the heart-lung preparation.** D. T. BARRY. *J. Physiol.* **57**, 368-78(1923).—The chief factor in the causation of edema is diln. of the colloids of the blood. Edema of the lung clears up to a varying extent when the colloid osmotic pressure of the blood is raised by gum arabic. J. F. LYMAN

**The pathogenesis of tetany. II. The mechanism involved in recovery from parathyroid tetany.** L. R. DRAGSTEDT, KENNETH PHILLIPS AND A. C. SUDAN. *Am. J. Physiol.* **65**, 368-78(1923).—Dogs completely parathyroidectomized and kept alive without tetany on a special carbohydrate diet (*C. A.* **17**, 313) are much less resistant to guanidine, methylguanidine, trimethylamine, histamine, and the various intestinal poisons than are normal dogs. In the doses used these drugs produced depression in normal dogs; while guanidine and methylguanidine may produce symptoms of tetany in parathyroidectomized dogs in doses that have little or no effect on normal dogs. Recently parathyroidectomized dogs are less resistant to the various poisons used than are animals that have recovered for long periods. The evidence of the expts. seems most in harmony with the theory that the parathyroid glands form part of the detoxicating mechanism of the body. **III. Exciting factors in experimental tetany in dogs.** *Ibid.* 503 ff. Dogs that have recovered from parathyroidectomy on a dietary which prevents intestinal bacterial proteolysis can be thrown into convulsions in various ways such as feeding large amt. of meat, exposure to high temp., muscular exercise, sexual excitement, or bacterial infections. It is concluded that tetany must be looked upon as a pathol. condition which arises through the accumulation of toxic substances in the blood stream beyond the capacity for the physiol. detoxicating mechanism to care for them. The relation between the parathyroids and tetany in man is discussed. J. F. LYMAN

**Precipitinogen and precipitin in the living body.** T. OGUCHI. *Japan Med. World* **3**, 187-9(1923).—Five cc. normal horse serum per kg. were injected intravenously in the rabbit. Blood samples were taken at intervals of from 6 hrs. to 50 days. Twenty-seven samples thus taken were tested serologically. Serum contains at least 6 different protein substances of different activity and specificity. Chemically sepd. albumin and globulin are not identical immunologically. When heterogeneous serum is injected, globulin is split first and then albumin. The precipitins and precipitinogens that have mutual affinity do not appear together in the body. The formation of a precipitin indicates the complete splitting of its sp. precipitinogen. This phenomenon is seen whether the heterogeneous serum is introduced in large or small amt., injected repeatedly or only once. M. E. MAVER

**Luetic reaction precipitates.** K. TAOKA. *J. Bact. (Japan)* No. 328 (1923); *Japan Med. World* **3**, 190.—By passing  $\text{CO}_2$  through fresh guinea pig serum, or by addn. of the serum loses its power to dissolve the luetic serum ppts., although there occurred no change in its complemental power. The ppts. which had been treated with acid and those which had not been fixed by complements are dissolved by the fresh guinea-pig serum. The solvent property of the fresh serum is dependent upon its alky. M. E. MAVER

**Acetone "bodies" in the urine in measles.** O. NAGAHARA. *J. Oriental Med. Soc.* **1**, No. 1; *Japan Med. World* **3**, 196(1923).—N. found acetone "bodies" in 67% of the cases of measles. These appeared with the Koplik's spots, and increased until the eruptive stage. M. E. MAVER

**Osmotic resistance of erythrocytes.** WERNER TESCHENDORF. *Folia Hematol. I Abt.* **28**, 87-94(1923).—In 2 cases of pernicious anemia the resistance was normal,

hemolysis being complete at 0.25% NaCl; in 2 other cases there was a very slight drop in beginning hemolysis; and in 2 others a definite increase, complete hemolysis occurring at 0.30%. In 3 cases of myelogenous leucemia complete hemolysis occurred at about 0.30%; in a case of Banti's disease, 0.30; in a case of lymphogranulomatosis 0.25%. In a case of hemolytic icterus, hemolysis occurred between 0.64% and 0.44%; in polycythemia, between 0.44% and 0.25%; in a morphine-cocaine addict, between 0.60% and 0.40%. In HgCl<sub>2</sub> and Pb poisoning the resistance was normal. In MeOH poisoning, hemolysis occurred between 0.52% and 0.40%. JOHN T. MYERS

**Morphological and biological studies on blood and spleen. I. The normal character of the blood and spleen of new born dogs. II. The changes in blood after splenectomy in new born dogs.** TOSCHIO TAKAGI. *Folia Hematol. I Abt.* 28, 95-195 (1923).—There is a marked decrease in red cells during the first few days after birth. The resistance of the red cells to hypotonic NaCl solns. is higher and the limits of beginning and complete hemolysis are wider than in adult dogs. Polychromatic cells are more numerous. Nucleated red cells are scarce. After splenectomy the osmotic resistance of the red cells is as great as in the adult. Much biol. data are also given. JOHN T. MYERS

**The effect on erythrocytes of resistance-raising and -lowering poisons.** N. W. SCHRUSTROFF. *Folia Hematol. I Abt.* 28, 281-6 (1923).—Moderate daily doses of phenylhydrazine fed to animals gradually raised the resistance of the erythrocytes to hypotonic NaCl soln. during 8 or 9 days. During this time the number of erythrocytes fell from 6 million to 1 or 2 million. After this the resistance gradually fell to sub-normal. Moderate doses of toluenediamine, Pb, As, Na glycocholate and reptilian venoms gave similar results. Very small doses of these poisons given daily had no elevating effect but caused a sub-normal resistance after two weeks. Very large doses of the various poisons produced the picture of pernicious anemia. The osmotic resistance of the cells rose and did not fall. JOHN T. MYERS

**Phosphorus and calcium in the blood in renal disease.** O. L. V. DE WESSELOW. *J. Hyg.* 16, 341-62 (1923).—A marked increase of phosphate content of the blood in nephritis is of grave prognostic import. The symptoms of uremia appear to have a close relationship to phosphate retention. Usually phosphates and urea run a parallel course. The excretory mechanism is probably the same for each. Independent variations of the two bodies frequently occur, probably owing to circumstances extraneous to renal function. A diminished serum Ca is a bad omen, and seems to be connected with the general tremor and localized twitches of the final stages of uremia, but not with generalized convulsions. The Ca content of serum in nephritis is inverse to the P content. JOHN T. MYERS

**An experimental study of the Neisser-Wechsberg phenomenon.** C. G. PANDIT. *J. Hyg.* 21, 406-38 (1923).—The inhibiting phenomenon of Neisser and Wechsberg as frequently seen with bacteriolytic sera occurs also with hemolytic sera. It develops early in immunization and tends to disappear. When sera stand *in vitro* the inhibiting factor disappears first. It is not due to complementoids or to special inhibiting antibodies, but probably to a dissociation of the antigen amboceptor complex. This occurs only when amboceptor is present in excess. It is probable that early in immunization amboceptors with a weak combining affinity are produced, which are later replaced by amboceptors capable of a more permanent union. The term amboceptor dissociation effect should replace the name complement blocking. Inhibition is specific. J. T. M.

**The constitution of the normal hemolysis of ox serum for guinea-pig blood with special reference to filtration experiments and to conglutination.** N. YOSHINARE. *J. Path. Bact.* 25, 153-72 (1923).—This work shows that fresh ox serum which has been inactivated by filtration through a Berkefeld filter is capable of sensitizing guinea pig cells so that they will undergo lysis on the addition of complement. Hence the lytic action is due to an antibody plus complement. The process of sensitization is not assisted by the presence of complement. Conglutinin is not essential to lysis. Conglutination depends on some distinctive property of ox serum acting together with antibody and complement. The lytic antibody of filtrates is fairly stable but agglutinating properties rapidly deteriorate upon standing at room temp. or on ice. JOHN T. MYERS

**The difference of pathologic and normal serums and the autophagocytic property of the latter.** FERNAND CHODAT AND A. KOTZAREFF. *Compt. rend.* 177, 460-3 (1923); cf. R. Chodat, *C. A.* 8, 3569.—Normal and pathologic serums were tested by Chodat's reagent (*p*-cresol 1/250, 2 cc.; serum 25 drops; physiologically pure tyrosinase 15 drops). Normal serums retard the appearance of the red color, while those of certain maladies, notably cancer, give an immediate intense reaction. Apparently in pathologic serums certain constituents have undergone a proteolysis corresponding to the development of

the malady, and the Chodat reaction may be of use in observing the progress of the disease. In order to det. if the alexin modified the reaction, normal and pathologic serums were heated for 30 min at 56° to destroy the alexin. The pathologic serums gave the same strong reaction after as before heating. Normal serums, which before heating strongly retarded the reaction, after heating reacted almost as rapidly as the pathologic serums. However the disappearance of the alexin is not considered essential to the reaction. Heating normal serum to 56°, in addn. to destroying the alexin, induces other modifications. It is believed that the difference between normal and pathologic serums exand lies in the disappearance of the factor of inhibition of enzyme action (in this case the tyrosinase). The normal serum is protected by an *autophylaxis* which may disappear in the course of certain diseases such as cancer. L. W. RIGGS

**Puerperal eclampsia and phenomena of shock. Arrest by pilocarpine.** LEVY-SOLAL AND A. TZANCK. *Compt. rend.* 177, 148-9 (1923).—Expts. with guinea pigs proved that the serum of healthy females, whether pregnant or not, was inoffensive but that the serum of eclamptic females immediately caused death by convulsions resembling those of eclamptic crises. Eclampsia and death are not due to massive coagulation of the blood. Eclampsia presents analogies to the colloidaloclastic shock. Simultaneous injections were made of atropine, adrenaline, eserine or pilocarpine, resp., with eclamptic serum. Of these drugs pilocarpine hydrochloride was alone effective and prevented death in 80% of the trials. L. W. RIGGS

**The total and the nitrogenous metabolism in exophthalmic goiter.** W. M. BOOTHBY AND IRENE SANDIFORD. *J. Am. Med. Assoc.* 81, 795-800 (1923); cf. *C. A.* 16, 3687.—Nine patients with marked and unquestionable exophthalmic goiter were subjected to a careful metabolic study under excellent hospital, lab. and dietary conditions for securing accurate results. The evidence presented by this study indicates that there is no measurable increase in the endogenous protein metabolism in exophthalmic goiter; therefore, it cannot be the cause of the increased basal metabolism in this disease. The cells consume at an accelerated rate whatever type of food is brought them, but in none of the expts. is there any evidence to indicate that any of the 3 food substances, fat, carbohydrate or protein, is burned in a qualitatively abnormal manner. As in the normal subject, the body's own stores of these substances are not drawn on except to meet deficiencies in food intake. However, unless the daily calorie requirement is supplied by a large food intake, loss of wt. and a general weakened condition with decreased resistance are more rapidly developed, and of more intense form than that seen in normal subjects as the result of undernourishment. Patients with exophthalmic goiter who are losing wt. are more dangerous operative risks than those who are well nourished, or gaining wt. L. W. RIGGS

**The question of the existence of monogenic-polyergic precipitins.** E. FRIEDBERGER AND A. LASNITZKI. *Biochem. Z.* 137, 312-9 (1923); cf. *C. A.* 17, 583.—Antisera or antigen, or both, were extd. with Et<sub>2</sub>O before mixing, and the amts. of precipitin compared. Both antigen and antibody concerned in the production of a heterologous precipitin contain a constituent, essential for precipitin formation, which is sol in Et<sub>2</sub>O, and hence probably lipoidal. In homologous precipitin formation this is true in greatly diminished degree. Further, the homologous precipitin is slightly, though heterologous, markedly, sol. in Et<sub>2</sub>O. GEORGE ERIC SIMPSON

**Action of arsphenamine on serum.** YOSHIO YASAKI. *Biochem. Z.* 137, 450-5 (1923).—The ppt. obtained by mixing arsphenamine and serum (cf. *C. A.* 16, 1967) is formed with the albumin; it is not formed with the globulins or with inactive serum (heated 1/2 hr. at 56°). It disappears on warming but reappears on cooling. The antigenic character of the serum is not changed by arsphenamine. G. E. S.

**The metabolism of transplanted tumors. I. Carbohydrate metabolism.** KUNJI TADENUMA, S. Hotta AND J. HOMMA. *Biochem. Z.* 137, 536-41 (1923).—See *C. A.* 17, 3207. GEORGE ERIC SIMPSON

**The protein-cholesterol fractions of sera from progressive paralytics; their bearing on the Wassermann reaction.** ENNIO RIZZATTI. *Biochem. Z.* 138, 43-55 (1923).—In 10 cases showing negative Wassermann reactions, and in 10 cases of progressive paralysis with positive Wassermann reactions, the serum was ptd. with 1/2 satd. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>. Cholesterol was extd. (a) from the filtrate by Et<sub>2</sub>O, (b) from the filtrate after sapon., (c) from the ptd. globulin by 85% EtOH, and (d) from the globulin after sapon. a, b and c and total cholesterol were greater in normal sera; d was greater in Wassermann plus sera. Thus a cholesterol-globulin combination is characteristic of the latter. GEORGE ERIC SIMPSON

**Pancreas studies. I. B. STUBER. The effect of pancreatic extract on diabetes mellitus.** A. R. KRASTEL. *Biochem. Z.* 138, 56-71 (1923).—The phosphotungstic

acid ppt. from a MeOH ext. of pancreas was digested in Ba(OH)<sub>2</sub>, 12 hrs., and Ba removed in the usual way. The resulting material was fractionated by Kutscher's procedure; the fraction ppts. by AgNO<sub>3</sub> in alk. reaction was the most potent. Blood sugar decreased after intravenous or subcutaneous administration, both in adrenaline hyperglucemic and in pancreatectomized animals. The bibliography contains references to German publications exclusively.

GEORGE ERIC SIMPSON

**Analysis of a liquid from a paraovarian cyst.** M. GÜRBET. *J. pharm. chim.* 28, 177-8(1923).—From a cyst developed during 5 yrs. as the result of a fall, 9.2 l. of an alk., almost clear and colorless liquid, d<sub>4</sub> 1.003, was removed. It contained, in g. per l., ext. dried at 100° 10.3; ash 8.1; NaCl 5.85; sulfates, carbonates, no phosphates; urea 0.22; fat 0.01; serin and globulin 1.40, pseudomucin 0.45. S. WALDBOTT

**Chemical changes in the blood of the dog after obstruction of the esophagus and of the cardiac end of the stomach.** R. L. HADEN AND T. G. ORR. *J. Exptl. Med.* 38, 477-85(1923); cf. *C. A.* 17, 1669, 1670.—Ligation of the cardiac end of the stomach or of the esophagus in 10 dogs produced a severe toxemia and rapid death. In 7 of the animals there occurred a marked rise in the total non-protein N and urea N of the blood. The dogs living longest with cardiac obstruction showed a fall in blood Cl and a rise in the CO<sub>2</sub>-combining power of the plasma. All the dogs with an obstruction of the esophagus showed a fall in blood chlorides. Control animals subjected to other types of abdominal operation showed no significant changes in the blood. C. J. WEST

**The power of various serums for fixing salicylic acid.** W. STORM VAN LEEUWEN AND MISS H. DRZIMAL. *Rec. trav. chim.* 42, 736-9(1923).—It has long been known that various persons are excessively sensitive to certain medicaments. It is remarkable that these phenomena of abnormal sensitivity (urticarias, eczema, asthmatic attacks) depend very little on the chem. compn. of the substance that produces them. It seemed that these effects might be due to a deficient fixation power for these drugs and that the excess of "free" drug gives rise to the secondary effects. The fixation power of the serum of 3 asthmatics and 7 normal persons for salicylic acid was detd. by a method previously developed (v. L. and Beutner, *Arch. exper. Path. Pharm.* 96). Of these the values for the asthmatics were considerably lower than those for the normals and the results confirm the hypothesis. No suggestions as to the cause of difference are given except that differences in the H-ion concn. do not play any role.

E. J. WITZMANN

## H—PHARMACOLOGY

ALFRED N. RICHARDS

**Urine acidity after the injection of adrenaline chloride.** R. S. HUBBARD. *Proc. Soc. Exptl. Biol. Med.* 20, 187-9(1922).—The subcutaneous injection of 0.001 g. adrenaline chloride (Parke, Davis & Co.) was followed by a lowering of the CO<sub>2</sub>-combining power of the blood plasma, and by a slight increase of the acidity of the urine, in this respect differing from the results of polypnea.

C. V. B.

**Action of the active compounds of quinoline carboxylic acid (cincophen, diapurine) on purine metabolism in chronic myelogenous leucemia.** ANGELINA LEVI. *Biochim. e terapia sper.* 10, 59-83(1923).—Cincophen and diapurine in chronic leucemia augment the uric acid in the same proportion as in normal health, but less than in gout; however, the absolute increase is greater than in health. There is also an increase in purine bases and total N. There is no appreciable change in the number of leucocytes. The mobilization of the reserve nucleins is more marked than in normal health.

H. W. BANKS, 3RD

**The action of inorganic salts and organic compounds of bromine and iodine on the organism.** G. TELLERA. *Boll. chim. farm.* 62, 385-90(1923).—A review. A. W. D.

**A clinical report on acute cases of mercuric chloride poisoning.** L. C. GATEWOOD AND ARTHUR F. BYFIELD. *Arch. Intern. Med.* 32, 458-63(1923).—A report on 71 cases of Hg poisoning. Neither high non-protein N nor high creatinine in the blood necessarily indicates a fatal outcome.

I. GREENWALD

**Histophysiological studies of the influence of radiation by ultra-violet light.** A. ECKSTEIN AND W. V. MÖLLENDORFF. *Arch. Kinderheilk.* 62, 206-18(1923).—Animals exposed to ultra-violet light after injection of dyes showed on autopsy within an hour definite accumulations of these dyes in the kidneys while controls showed none. Autopsies after some time showed smaller deposits of dye in the kidneys of the radiated animals than in the controls. Animals radiated for a long time showed degeneration of the dyed tubules and a reaccumulation of dye in the regenerated cells. No other organs than the kidneys showed such typical findings.

I. NEWTON KUGELMASS

**Rate of liberation of acid by bis(β-chloroethyl) sulfide and its analogs in its relation**

**to the acid theory of skin vesication.** R. A. PETERS AND ERNEST WALKER. *Biochem. J.* 17, 260-76 (1923).—The theory that the intracellular liberation of acid is responsible for the vesicant action of bis(*n*-chloroethyl) sulfide is rendered untenable by the fact that the vesicant action and rate of acid liberation do not run parallel in the series of compds. studied. BENJAMIN HARROW

**The action of phlorhizin on the kidney.** E. B. MAYRS. *J. Physiol.* 57, 461-6 (1923).—In rabbits which have been poisoned with phlorhizin and in which  $\text{Na}_2\text{SO}_4$  has been injected intravenously sulfate seems to be excreted in the urine about 1.37 times as well as dextrose even after the max. phlorhizin effect on the kidney has been obtained. It is believed that there is some reabsorption of dextrose in the cells of the tubules even in complete phlorhizin poisoning. The use of phlorhizin for renal efficiency tests is criticized. J. F. LYMAN

**The cardiac action of benzoyl-*p*-hydroxyphenylurethan and urethan derivatives.** I. TOMIMAGA. *J. Okayama Med. Soc.* No. 297 (1923); *Japan Med. World* 3, 192.—Benzoyl-*p*-hydroxyphenylurethan accelerated the heart action remarkably. *p*-Hydroxyphenylurethan caused a similar but weaker action. Salicylic *p*-hydroxyphenylurethan did not accelerate the heart. M. E. MAVER

**The effect of germanium dioxide upon the blood.** J. H. MÜLLER AND MIRIAM S. ISZARD. *J. Metabolic Research* 3, 181-99 (1923).—In animals treated with  $\text{GeO}_2$  the localization of the Ge was found on analysis to be in the cellular elements of the venous blood as opposed to the predominance of the Ge in the plasma of the arterial blood. This change in the localization of the metal during the course of circulation is ascribed to the influence of O. The satn. capacity of blood for  $\text{GeO}_2$  was found to be 0.014% by wt. On this basis 0.8-1.0 g. would be sufficient for a max. effect in a human subject of av. wt. The min. amt. of  $\text{GeO}_2$  absorbed by the blood of treated animals was 0.006%. From the chem. and spectroscopic analyses of the blood of treated animals the authors are led to believe that the  $\text{GeO}_2$  injected is reduced to GeO in the tissues of the animal, "probably resulting in the addition of GeO to the hemoglobin of the cells of the venous blood. Subsequent oxygenation of such blood in the lungs then releases the Ge from the cells by converting it to the dioxide, an anhydride of an acid comparable to  $\text{H}_2\text{CO}_3$  but non-volatile. The  $\text{GeO}_2$  appears simply to dissolve in the plasma, where it is forced to remain and return to the tissues with the arterial blood. Here reduction again takes place, reproducing GeO and completing the cycle." These reactions, if true, plainly indicate that Ge in the blood stream may act as an O-carrier, and explain in part the physiol. effect which this element produces in the animal system, resulting in erythropoiesis." W. A. PERZWIG

**Biological reactions of X-rays; Effect of radiation on the nitrogen and salt metabolism.** CARL F. CORI AND G. W. PUCHER. *J. Roentgenology* 10, 738-45 (1923).—Three cases of different tumor types were studied to see if, by analysis of org. and inorg. metabolites as evinced by urinary excretion, some information might be obtained as to the mechanism of tumor destruction. The data include both moderate and heavy X-ray therapy. The total N in all cases increased in the post-radiation periods. Of the different N fractions, the urea plus  $\text{NH}_3$  and the uric acid were the only ones which showed increase. Since there was also increase of P it is probable that a large part of the increase of total N is due to the elimination of the destroyed cells. The expts. indicate that "Roentgen sickness" is not due to excessive cell catabolism, since the cases with the largest tumors and greatest increase in N excretion were not so ill after the radiation as the case with the smallest tumor and the lowest N output. In all cases a marked retention of chlorides was observed which could not be accounted for by retention of fluids. EDITH H. QUTMBY

**Lead studies. VI. Absorption of lead by the upper respiratory passages.** H. L. BLUMGART. *J. Ind. Hyg.* 5, 153-8 (1923).—Dogs and cats under ether anesthesia were excized in the midline to show the trachea and esophagus; the latter was completely occluded by ligatures and the trachea was opened below the thyroid and a tightly fitting glass canula was inserted. The lumen of the upper end of the trachea was then occluded by 2 or more ligatures, and the wound was closed in the usual way. Powdered lead carbonate was then sprayed into the nose with an ordinary nasal atomizer, the amt. being detd. by weighing the atomizer before and after use. The animals were kept in cages and were carefully observed for any signs of tracheal obstruction. Physiol. saline or 10% glucose was introduced intraperitoneally. The animals died in from 18 to 36 hrs. Each animal was carefully examined to make sure that no absorption of Pb had taken place by the esophagus or trachea; the thoracic portion of the esophagus, the trachea below the canula, and the lungs were analyzed as a group. In every case the ligatures were effective in preventing the passage of Pb. The head was cut off and

discarded. The skeleton, remaining internal organs, muscles, liver including gall bladder were each analyzed separately according to the procedure of Fairhall (cf. *C. A.* 16, 2160). Conclusions: Particulate matter in the form of pulverized lead carbonate is readily absorbed from the upper air passages of dogs and cats. The absorption is rapid and of a magnitude far in excess of the min. toxic dose. Absorption in industry of Pb salts by the upper respiratory passages would therefore seem to be a definite possibility. L. W. RIGGS

**The physiological action of the proteinogenous amines. VI. Vegetative nervous system and specific dynamic action.** J. ABELIN. *Biochem. Z.* 137, 273-99(1923); cf. *C. A.* 16, 3128.—After *per os* administration of thyroid substance, tyramine, phenylethylamine, or adrenalin, to rats, the sp. dynamic action of proteins increased. On cessation of administration, total metabolism and sp. dynamic action gradually returned to the normal value. This is regarded as further proof of the *interrelation between metabolism and the vegetative nervous system*. **VII. The effect of diiodotyrosine, diiodotyramine and hordenine on the respiratory exchange.** J. ABELIN. *Ibid* 161-8.—Diiodotyramine (15 mg. or less subcutaneously, 70 mg. or less *per os*) and diiodotyrosine (50 mg. or less, subcutaneously) did not affect the respiratory exchange of white rats. In contrast to tryamine they have very slight sympathomimetic action. Peroral administration of hordenine sulfate (0.3 g. or less) caused a slight fall in the respiratory exchange. GEORGE ERIC SIMPSON

**The effect of the phosphate ion on carbohydrate metabolism. I. The effect of the phosphate ion on the sugar economy of the surviving frog liver.** H. ELIAS AND A. LOW. *Biochem. Z.* 138, 279-83(1923); cf. *C. A.* 16, 3123.—By perfusion of frog liver with an isotonic soln. of glucose plus phosphate (*pH* 7.4-7.6), glucose is mobilized. More is found in the perfusion fluid after perfusion than before. The view that the decrease in the blood sugar of diabetics produced by phosphate administration is the result of enhanced liver storage is not supported by these expts. **II. The influence of intravenously administered phosphate solution on the blood sugar of dogs and rabbits.** H. ELIAS, C. POPESCU-INOTESTI AND C. ST. RADOSLAV. *Ibid* 284-93.—In the following expts. *N Na<sub>2</sub>HPO<sub>4</sub>* (I) and 0.33 *N Na<sub>2</sub>HPO<sub>4</sub>* (II) solns. are administered intravenously. Dosage is given in cc. per kg. body wt. Phosphate administered in amts. which are without effect on the normal blood sugar in man lowers this in rabbits and dogs. In dogs the extent of the decrease is proportional to the size of the dose (0.5 to 2 cc. of I or II were used). In rabbits a diminution is produced by injecting small doses (up to 1.7 cc. I or II); larger doses produced hyperglycemia. **III. The effect of intravenous phosphate solutions on adrenalin hyperglycemia in rabbits and dogs.** *Ibid* 294-8.—Adrenalin hyperglycemia is reduced by administering phosphate I to 1.5 hrs. before adrenalin (dosage 0.4 cc. I, 0.5 cc. II for rabbits; 0.5 cc. I, 1.5 cc. II for dogs). **IV. The effect of the phosphate ion on the blood and urine sugar of diabetic-depancreatized-dogs.** *Ibid* 299-306.—Injections of phosphate, too small to change the blood sugar in normal animals, reduce the hyperglycemia and glucosuria in pancreatectomized dogs with glucose: N ration  $\frac{2}{3}$  2.6 (dosage: 0.5 cc. I; 1.5 cc. II). GEORGE ERIC SIMPSON

**Toxicity of neoarsphenamine. II.** F. W. HEYL, M. C. HART AND W. B. PAYNE. *J. Am. Pharm. Assoc.* 11, 214-9(1923).—Continuation (cf. Heyl and Miller, *C. A.* 16, 2757). Arsenamine was prep'd. from materials of relatively fine purity, 3-amino-4-hydroxyphenylarsinic acid instead of the corresponding nitro acid and centrifugation being used. In some instances the product is purer than that from the nitro acid. The M. T. D. for albino rats varied from 140 to 170 mg. per kg., while the product from the nitro acid was tolerated at only 110 mg. per kg. The same stock of rats tolerated neoarsphenamine at 440 mg. per kg. Neoarsphenamine prep'd. from arsphenamine of relatively low toxicity was not much less toxic than other specimens prep'd. from the parent substance having considerably higher toxicity. Other factors related to phys. differences appear to have greater significance than the toxicity of the parent substance. Rats show great variability in toxicity toward the same specimen of neoarsphenamine, while they do not exhibit this behavior toward arsphenamine. The max. decrease in toxicity due to prep'n. from amino acid, pure hyposulfite and centrifugation is 40-60 mg. per kg. L. E. WARREN

**Chemical-pharmacodynamic relationships of atropine and homatropine.** D. I. MACHT. *J. Am. Pharm. Assoc.* 11, 882-96(1922).—See *C. A.* 17, 2749. L. E. W.

Tetrachloroethane poisoning (PARMENTIER) 13.

## I—ZOOLOGY

R. A. GOKTNER

**The hydrogen-ion concentration of the soil and of natural waters in relation to the distribution of snails.** W. R. G. ATKINS AND M. V. LABOUR. *Sci. Proc. Royal Dublin Soc.* 17, 233–40 (1923).—Cf. *C. A.* 17, 3345. E. J. C.

**The influence of combinations of inorganic salts and of variations in hydrogen-ion concentration on the heliotropic response of *Arenicola* larvae.** R. S. LILLIE AND C. E. SHEPARD. *Am. J. Physiol.* 65, 450–61 (1923). Orientation to light in *Arenicola* larvae depends on the balanced musculature on the opposite sides of the body, the cilia furnishing the means of propulsion. For continuance of positive heliotropism a balanced proportion of salts (especially NaCl, CaCl<sub>2</sub>, and KCl) in the external medium is necessary, as well as an almost neutral or slightly alk. reaction ( $p_H = 6$  to 10). No heliotropic response was shown in any of the solns. of a single salt [NaCl, KCl, CaCl<sub>2</sub>, and MgCl<sub>2</sub>]. The addition of CaCl<sub>2</sub> to isotonic NaCl soln. enables heliotropism to continue several min.; when both MgCl<sub>2</sub> and CaCl<sub>2</sub> are added the beneficial effect is still more marked, although MgCl<sub>2</sub> alone has little effect. Small amts. of KCl added to a balanced soln. of NaCl, MgCl<sub>2</sub>, and CaCl<sub>2</sub> enables heliotropism to continue for several hrs. RbCl, but not CsCl, has a similar effect. In balanced salt solns. a change in acidity from  $p_H$  of 6 to 5 reverses the heliotropic response, rendering the larvae negatively heliotropic. A further increase in acidity destroys all heliotropic response. An alky. greater than  $p_H$  10.5 arrests the response but has only slight effect in causing reversal. J. F. LYMAN

**The influence of carbon dioxide on the velocity of segmentation of sea urchin eggs.** G. H. A. CLOWES AND HOMER A. SMITH. *Proc. Am. Soc. Biol. Chem., J. Biol. Chem.* 55, fix (1923).—The velocity of segmentation of sea urchin eggs is an inverse linear function of the concn. of CO<sub>2</sub>. This function is independent of the concn. of H, Na, or Ca ions in the sea water within those limits compatible with normal development and is apparently unaltered by variations in temp. between 15° and 30°. CO<sub>2</sub> causes a progressive retardation or, at definite tensions, complete arrest of development at all stages from the freshly fertilized egg to the larval stage without causing any alteration in the normal cell structure (cytolysis, abormal division, etc.) such as are caused by most deleterious agents. A. P. LOTHROP

**The effect of injections of various substances upon the blood composition of the Tortugas crawfish, *Panulirus argus*.** SERGIUS MORGULIS. *Proc. Am. Soc. Biol. Chem., J. Biol. Chem.* 55, xxxiv–xxxvi (1923).—The compn. of arthropod blood varies rapidly with the changes in the nutritive condition of the animal and the effects of the injection deep into the thoracic muscles of glucose, sucrose, urea and (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> on the blood compn. have been studied. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> gets into the blood almost at once but is very rapidly excreted and is completely eliminated in 2 hrs. Urea produces a great increase in the non-protein and urea N which reaches a max. in about 2 hrs. The normal non-protein N level is reached in 12–14 hrs. after the injection. The injection of urea is always accompanied by an increase in the uric acid content, the changes in which run more or less parallel with the changes in the N. Temporary hyperglycemia is produced by injection of glucose, which reaches a max. in about 2 hrs.; the original level is usually re-established in 8–12 hrs. After injection of sucrose the reducing sugar in the blood increases in less than 1 hr. and the blood is also loaded with sucrose. After the 1st hr. the levels of reducing sugar and hydrolyzable sugar behave reciprocally. In 1 animal this was followed for 93 hrs. and hyperglycemia persisted until almost the very end of the expt. After 93 hrs. the original sugar level had been reestablished, though there was still 8 mg. of hydrolyzable sugar per 100 cc. of blood. A study of the blood of the crawfish, *Panulirus argus*, with special reference to the absence of creatinine in arthropod blood. *Ibid.* xxxvi–xxxvii.—The following min. and max. amts. of non-protein constituents of the Tortugas crawfish blood were found on analysis: sugar 19 and 71 mg.; non-protein N 15 and 29 mg.; urea N 6 and 11 mg.; uric acid 0.3 and 2.0 mg. per 100 cc. of blood. The influence of the nutritive condition of the animal was studied in one case for 44 hrs. after the animal had been brought to the lab. The sugar content at the end of 24 and 44 hrs. changed from the original level of 71 to 18 and 13 mg., resp.; the non-protein N from 16 to 14 and then to 10 mg.; the uric acid from 0.7 to 0.3 mg. after 24 hrs. and was entirely absent after 44 hrs. The complete disappearance of the uric acid has been noted to occur in a much shorter time. The blood at no time showed any

trace of creatinine and the same fact has been observed in the case of several other arthropods. "References in the literature to creatinine in arthropod blood notwithstanding, it can be stated definitely and with the support of an extensive number of analyses that creatinine is never present in the blood of arthropods."

A. P. LOTHROP

## 12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

**Preservatives in foodstuffs.** R. DUDFIELD. *Pharm. J.* 110, 430(1923).—An official report in which the max. and min. amts. of  $H_2BO_4$ ,  $SO_4$ ,  $Na_2SO_4$ ,  $CuSO_4$ ,  $BzOH$  and salicylic acid found in about 10,000 samples of food stuffs are tabulated. S. W.

**Notes on the examination of preserved meats, etc.** OSMAN JONES. *Analyst* 48, 429–33(1923).—Tinned cans are examd. for flaws in tin coating by flooding with 3%  $K_3Fe(CN)_6$  soln. contg. 10% gelatin. Spots of Prussian blue denote flaws.  $ZnCl_2$  when used as flux in soldering cans increases markedly the amt. of Sn taken up by the contents. When rubber in a solvent such as benzene is used to seal cans, a disagreeable flavor and unpleasant effects are sometimes due to incomplete evapn. of solvent. Methods for bacterial examn. of contents of cans are described. Sn is generally found in contents of cans, in case of fruits and vegetables, as high as 0.027%. Tests for coloring matter and preservatives are briefly described. A. R. LAMB

**The determination of iodine in large samples of foodstuffs.** J. F. McCLENDON AND O. S. RASK. *Proc. Soc. Exptl. Biol. Med.* 20, 101(1922).—Kendall's method was satisfactory for amts. as low as 0.02 mg.  $I_2$ ; the accuracy was inversely proportionate to the amt. of org. matter involved. Cereal grains were made into beer, alkalinized and the alc. volatilized. The fumes of combustion were passed through an alk. soln. which removed the  $I_2$ ; the soln. was then shaken with C tetrachloride, and this in turn shaken with a dil. soln. of  $SO_4$ , which left the  $I_2$  in aq. soln. By this method org. and inorg. inert constituents may be eliminated. C. V. BAILEY

**The energy value of some dried fruits.** A. A. RAMSAY. *Agr. Gaz. N. S. Wales* 33, 57–8(1922).—Tables are given showing (1) the chem. compn. of dried apricots, peaches, nectarines, pears and prunes, and (2) the calorific value of various food products. K. D. JACOB

**The ternary system sugar-citric acid-water.** A contribution to the theory of fruit ices from the standpoint of the phase rule. ROBERT KREMMANN AND HERMANN EITEL. *Rec. trav. chim.* 42, 589–46(1923).—Fruit ices consist of more or less completely frozen mixts. of sugar,  $H_2O$  and fruit juices. Lemon ice is a common ice of this sort which is prep'd. by freezing a certain mixt. of sugar,  $H_2O$  and lemon juice, which may be considered as a 3-component system (disregarding the osmotically inert ethereal oils). It is clear that a mixt. such as is used in making these ices will first sep. ice until the eutectic curve of ice and sugar or of ice and citric acid is reached. The further crystn. follows one of these 2 curves, when equil. appears and supercooling phenomena fail to appear until the ternary eutectic of sugar,  $H_2O$  and citric acid is reached. It will be best if the fruit ice melts at as low a temp. and as homogeneously as possible to make its structure homogeneous. The citric acid- $H_2O$  and sugar- $H_2O$  binary systems were 1st studied. The ternary system was studied and data are given in tables and graphs. The results show that this ice when frozen consists mainly of ice which contains a small amt. of the binary eutectic of sugar and ice, while the ternary eutectic is present to the extent of a few % on the assumption that the ice is thoroughly frozen. If this is the case the temp. must be below  $-17.0^\circ$ . As a rule this is scarcely attained in practice. The degree of freezing will det. which of the 3 components and the relative amt. of each that will be present in the lemon ice. From the diagram given in the original and the temp. of the ice its compn. can be read off. The ideal requirement that the lemon ice should have the compn. of the ternary eutectic cannot be realized on grounds of taste since the acidity and sugar content are too high. E. J. WIRZEMANN

**The estimation of boric acid in "liquid eggs" and other food stuffs.** G. W. MONIER-WILLIAMS. *Analyst* 48, 413–5(1923).—Thompson's method often gives low results. The removal of  $Ca$  as  $CaSO_4$  and pptn. of  $P$  by magnesia mixt. is suggested (cf. de Koninck, *J. Am. Chem. Soc.* 19, 385(1897)). The sample is charred with concd.  $NaOH$  soln. in porcelain. The char is extd. with hot water and filtered into a 100-cc. flask. The filtrate is acidified with  $H_2SO_4$ . The residue and filter are ashed, the ash soln. is acidified with  $H_2SO_4$  and washed into the 100-cc. flask. One drop of Me red soln. is added and  $NaOH$  to neutrality. Magnesia mixt. is added to ppt. all  $P$  as  $MgNH_4PO_4$ .

and the soln. made up to vol. After standing 12 hrs. or after vigorous shaking for 5 min. the soln. is filtered. Fifty cc. are taken, and phenolphthalein and concd. NaOH soln. added to the boiling soln. till strongly alk. When the NH<sub>3</sub> is all driven off the flask is cooled, Me red added, and strong H<sub>2</sub>SO<sub>4</sub> soln. drop by drop till just acid. CO<sub>2</sub> is removed by boiling, and the soln. made exactly neutral to Me red with 0.1 N NaOH. Neutral glycerol is added to 30% as in Thomson's method and the boric acid is titrated with 0.1 N NaOH and phenolphthalein. Results of analysis of known samples are reported.

A. R. LAMB

**Estimation of boric acid in cream, milk, and other foods.** ANON. *Analyst* **48**, 416-7(1923).—This method is a modification of that of R. T. Thomson (*Analyst* **21**, 64) and is used in government lab. (Gt. Brit.). The sample is placed in a Pt dish, 3 drops phenolphthalein added, and N soln. of NaOH added to neutrality and 2 cc. in excess. After evapn. to dryness the sample is extd. twice with ether and the ethereal ext. filtered into a sepg. funnel, where it is washed with 5 cc. of N NaOH soln. and then with 5 cc. of water. The washings are added to the residue and filter paper in the Pt dish. NaOH soln. is added until the total is at least 2 cc. of N soln. for each g. of dry matter in the sample. The sample is then dried and charred, the char washed and filtered into a 100-cc. flask and the residue ignited. The ash is taken up with dil. HCl and filtered into the 100-cc. flask. The soln. is acidified, the CO<sub>2</sub> driven off, and after cooling, 5 cc. N CaCl<sub>2</sub> soln., and 5 drops phenolphthalein are added and N NaOH until a slight permanent ppt. is formed. Then 0.1 N NaOH soln. is added, with const. shaking, to neutrality. The soln. is then made up to 100 cc. and 75 cc. are filtered off. The filtrate is made acid to Me orange with 0.1 N H<sub>2</sub>SO<sub>4</sub>, boiled 10 min., and after addn. of 10 drops phenolphthalein, exactly neutralized to Me orange. Mannitol (0.5 g.) is added and 0.1 N NaOH to a pink color. Mannitol in 0.5 g. portions and NaOH are added until the mannitol fails to discharge the pink color. A blank is subtracted. Each cc. of 0.1 N NaOH soln. is equiv. to 0.0062 g. H<sub>3</sub>BO<sub>3</sub>. The residuum on the last filter and the rest of the 100 cc. of soln. are acidified with HCl, CaCl<sub>2</sub> soln. is added and the above process repeated. The result should be equiv. to that obtained from the 75 cc. aliquot. If larger, the correction should be added.

A. R. LAMB

**Studies of the composition of buttermilk and sour milk.** CURT MAYER. *Monatschr. Kinderheilk.* **26**, 433-8(1923).—Various buttermilks and sour milks were found to be similar in % of protein, fat, sugar, and in the pH range. Their effectiveness was attributed to *B. acidi lacticici*.

I. NEWTON KUGELMASS

**A rapid method for the determination of fat in ice cream.** P. P. LACOSTE. *Can. Chem. Met.* **7**, 208(1923).—An adaptation of the Babcock method was sought. Several modifications which had been previously suggested by various investigators were first tried out in comparison with the Roese-Gottlieb method, which was taken as standard. Most of these proved to be uncertain. The following method is proposed: Introduce 9 g. of sample into Babcock milk test bottle, add 9 g. H<sub>2</sub>O and 9 g. H<sub>2</sub>SO<sub>4</sub> (d. 1.84), then 1.5 cc. Am alc., mix, and follow the regular Babcock procedure. No variation is necessary when the fat content of the sample is between 6 and 24%. The following modification was made by M. A. de Chaunac: Transfer 18 g. of sample (or 9 g. sample with 9 g. H<sub>2</sub>O) to a Babcock bottle with 2 cc. Bu alc., add 9 g. H<sub>2</sub>SO<sub>4</sub> and proceed with the ordinary Babcock manipulation. The first method was found to check with results obtained on the Mojonnier machine within 0.15% and the latter within 0.10%.

FRANK E. RICE

**Determination of fatty acids in butter fat. II.** J. E. B. HOLLAND, MARY E. GARVEY, H. B. PIERCE, ANNIE C. MESSER, J. G. ARCHIBALD AND C. O. DUNBAR. *J. Agr. Research* **24**, 365-98(1923); cf. *C. A.* **12**, 1798.—On normal rations the percentage of total fatty acids in the butter fat of the Holsteins was substantially the same as that of the Jerseys, but their neutralization number was somewhat lower, the free fatty acids and sol. fatty acids were lower, while the percentage of insol. fatty acids was higher and their neutralization number and glycerol lower. The percentages of butyric, caprylic, myristic, palmitic and stearic acids were lower in the Holsteins than in the Jerseys; caproic, capric, lauric and oleic acids higher. With advancing lactation the percentages of total fatty and insol. fatty acids increased in both breeds while their neutralization numbers decreased, and the sol. fatty acids decreased. The addn. of oils and fats to the normal rations increased the insol. fatty acids partly at the expense of the solubles and partly by increasing the total fatty acids, and in consequence depressed the glycerol content. The neutralization numbers of the sol., insol. and total fatty acids were decreased on feeding peanut, corn and soy-bean oils and that of the insol. acids was increased by coconut fat. The data secured seem to warrant the conclusion that neither protein nor carbohydrates have any appreciable influence in changing the chem. compn. of the

butter fat, but that different oils and fats do modify to an extent the chem. compn. of butter fat, the modification depending on the compn. of the oils and fats fed. W. H. R.

**The determination of fat in buttermilk.** P. H. TRACY AND O. R. OVERMAN. *J. Dairy Sci.* 6, 393-405(1923).—In order to modify the Babcock test for use in testing buttermilk there was detd. the effect of varying the amt. of  $H_2SO_4$ , varying the length of the whirling period and the speed of centrifuging. All results were compared with analyses obtained by the Roese-Gottlieb method, which was taken as standard. Procedure found to give best results was: To a 10-g. sample add exactly 13.5 cc.  $H_2SO_4$  (d. 1.83), and whirl for periods of 10, 10 and 5 min. at 1000 r. p. m. To the results thus obtained add 0.2%, since it was found that the modified method gave results always low by that amt. The normal butyl alcohol method also gave results in close agreement with the Roese-Gottlieb.

FRANK E. RICE

**Tallowiness in butterfat.** G. E. HOLM AND G. R. GREENBANK. *Proc. Soc. Exptl. Biol. Med.* 20, 176-7(1922).—Butterfat exposed to light and air rapidly takes on a "tallowy" odor and flavor. Peroxides are formed and such fats slowly liberate I<sub>2</sub> from KI; the amt. of O<sub>2</sub> absorbed can be detd. by the Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> titer. The Kreis and chromic acid tests are positive. Oleic acid and triolein when exposed to O<sub>2</sub> give these tests, the former seems to be largely responsible for tallowiness in butterfat. C. V. BAILEY

**Investigations in regard to alkaline flavor in butter.** H. D. BARLOW. *Agr. Cas. N. S. Wales* 33, 807-11(1922).—In order to obtain data regarding the cause of alk. flavors occurring in some butters, generally attributed to over-neutralization of the cream, samples of butter were carefully prep'd. from cream with neutralized acidities of 0.2, 0.15, 0.1 and 0.05% acid, and 0.05, 0.1 and 0.2 alkali. Com. NaHCO<sub>3</sub> was used as a neutralizing agent and no preservative was added. The butter was examd. and graded immediately after prep'n. and after 6 wks. in cold storage. Butter made from cream neutralized as low as 0.2% alkali had no objectionable alk. flavor; it is considered that objectionable alk. flavors are due to faulty neutralization processes. The result arising from the addn. of an excess of NaHCO<sub>3</sub> was at once apparent in the flavor of the cream and this flavor appeared in the resultant butter but diminished slightly on storage. **Reaction of the aqueous extract towards litmus, etc.** A. A. RAMSAY. *Ibid.* 811-4.—Litmus, methyl orange, lacmoid and phenolphthalein did not prove satisfactory as indicators for the titration of the acid content of aq. exts. of butter. K. D. JACOB

**The relation of the oxidizability value and the amino and ammonia nitrogen content to the quality of cream and butter.** L. W. FERNS. *J. Dairy Sci.* 6, 412-26(1923).—Cream and butter of high quality were found to run lower in oxidizability value and there was a smaller percentage of the total N present in the amino and NH<sub>3</sub> forms than in low-grade products. (For methods used in the detns. see *C. A.* 16, 1280; 17, 156.) Samples of cream producing high-grade butter averaged 1.6 to 9.6 amino and NH<sub>3</sub>-N (% of total N) and 8.1 to 12.6 for creams producing second-grade butter. The corresponding butters varied from 0.8 to 6.3 for the first grade and 4.7 to 6.7 for the second. Oxidizability value of first-grade butters varied from 0.4 to 6.7 and those of second-grade from 3.4 to 8.8. Eleven samples of fresh cow milk gave amino N + NH<sub>3</sub> values of 2.2 to 3.6.

FRANK E. RICE

**A study of the action of certain bacteria, yeasts and molds on the keeping quality of butter in cold storage.** M. CRIMES. *J. Dairy Sci.* 6, 427-45(1923).—Pasteurized sweet cream was divided into lots, part being ripened. Incubations were made with pure cultures of various bacteria and yeast. Butters prep'd. from the different samples were stored 6-7 months at -6° F. and judged. No significant injury to butter quality was caused by the normal flora of pasteurized cream, proteolytic bacteria, *S. lactic*, *S. paracitrovorus*, *Oidium lactic*, nor various kinds of yeast, when inoculated into either sweet or sour cream. "There is no evidence that the enzymes produced during the growth of the microorganisms or the disintegration products produced on the death of the microorganisms affected the keeping quality of the butter in cold storage." It was believed that deterioration was due to some yet undetd. cause assisted by the indirect action of lactic acid, this cause probably being related to the quality of the cream when delivered at the creamery.

FRANK E. RICE

**Comparison of methods of reading cream tests.** F. J. DOAN, J. N. FIELDS AND C. W. ENGLAND. *J. Dairy Sci.* 6, 406-11(1923).—On account of the wide variations in procedure commonly recommended for reading the fat column in the Babcock test which yield sometimes wide results, several samples of cream were tested with 5 variations in reading. The fat in each sample was detd. by the Roese-Gottlieb method and all results were referred to it as a standard. The use of glymol gave the most accurate results, while reading from the bottom of the lower meniscus to the low point of the upper was almost as good. Other methods were more than 0.5% out of the way. F. E. R.

**The refractometric method for the detection of watering of milk.** MARIA CASTELLANI. *Ann. chim. applicata* 13, 41-4 (1923).—Hitherto the refractometric method for detecting the watering of milk has not been used because of the difficulty of prep<sup>g</sup>. the whey (cf. *Z. Nahr. Genuss.* 13, 186 (1907)). A method is developed by C. which is rapid and practical. To 50 cc. of milk is added with vigorous agitation 0.5 cc. of 25%  $Hg(NO_3)_2$  soln. (acidified with the least possible  $HNO_3$ ). By filtering, a very clear whey is obtained not possible by any previous method. Refractometric examn. of a great no. of grades of milk with varying d. and fat content, both in their original state and dild. to various degrees, indicated that genuine and watered milk should give the following refractometric readings (the values represent % diln. and degrees resp.): undild. 40-4; 10, 37-40; 20, 35-7; 30, 33-5; 40, 31-3; 50, 29-31. Any milk with a value below 40 should be suspected. The method is still applicable after the milk has been skinned.

C. C. DAVIS

**Reducing and oxidizing properties of milk.** P. HAAS AND T. G. HILL. *Pharm. J.* 111, 94, 127; *Chemist & Druggist* 99, 146-7 (1923).—Milk contains 2 substances which in presence of AcH can exert reducing and oxidizing action on  $NaNO_2$  and  $NaNO_3$ , resp. At 45°, reduction of  $NaNO_2$  reaches a max. in 1 hr., then the reverse process takes place, hastened by aeration. If N replaces air, the max. is maintained. As the reaction seems to be quant., it cannot be enzymic. When milk is mixed with AcH and  $NaNO_3$ , and rotated in presence of air, at const. temp., about 10 times the amt. produced by reduction is oxidized. In this process, peroxidase disappears simultaneously with the oxidizing substance. Finally the activating AcH itself can destroy these very substances, as milk after rotating with air and AcH alone becomes inactive towards  $NaNO_2$ ,  $NaNO_3$ , methylene blue and guaiac tincture in presence of  $H_2O_2$ .

S. WALDMOTT

**Detection of concentrated sterilized milk in mixtures with normal raw milk.** EMM. POZZI-ESCOR. *Ann. chim. anal. chim. appl.* 5, 272-4 (1923).—The following modification of the Evenson procedure (*C. A.* 16, 1815) is recommended: About 25 cc. of milk is dild. with an equal amt. of  $H_2O$  and coagulated by the addn. of a small amt. of dil.  $H_2SO_4$ . This is shaken vigorously and centrifuged until the washings no longer give a test for lactose when treated with  $\alpha$ -naphthol and  $H_2SO_4$ . The washed casein is suspended in a 5% soln. of NaOH and warmed several min. by immersing in boiling  $H_2O$ . Casein of fresh milk dissolves to a colorless soln. while that of sterilized milk or of mixts. produces a yellow soln. The test should be made in comparison with a sample of milk known to be unheated. During sterilization there is a combination between protein and lactose or decompn. products from lactose so that the lactose cannot be removed from the casein ppt. on washing. The yellow color is due to a reaction between this double compd. and NaOH. Another test is suggested for the detection of sterilized milk in raw milk which depends upon a change in the milk sugar resulting from the exposure to heat. A transparent serum free from albumin is prep<sup>d</sup>. by the use of metaphosphoric acid and to this serum is added Nessler reagent. When sterilized milk is present an intense yellow color is produced, changing to a grayish green ppt. This test is unreliable when applied to soured milk.

P. E. RICE

**The estimation of dirty sediment in milk.** A. R. TANKARD. *Analyst* 48, 444 (1923).—A modification is described of an earlier method (cf. *C. A.* 16, 3140) which seps. cells and curdy deposits from true extraneous sediment. In this method the milk is drawn off and the sediment washed with nearly satd.  $NaCl$  soln. and distd. water. Details are given.

A. R. LAMB

**The relationship of bacteria to the quality of cheddar cheese.** J. K. MURRAY. *Agri. Gaz. N. S. Wales* 33, 867-76 (1922).—The relation of desirable and harmful bacteria to the quality of cheddar cheese, control of bacterial activity by the fariner and by the factory, methods of checking bacterial activity and reducing contamination from farm sources, and contamination by manure and utensils are discussed. A bibliography of 11 references is included.

K. D. JACOB

**The loss of caffeine during tea-firing.** P. A. KEILLER. *Tropical Agriculturist* 60, 366-8 (1923).—A white deposit sometimes found in tea dryers has been thought to contain volatilized caffeine. Analyses of certain deposits show, however, that the caffeine content is about the same as in ordinary tea fluff.

M. S. ANDERSON

**The presence of quercitrin in the leaves of *Camellia theifera* and in prepared tea.** J. J. B. DRUSS. *Rec. trav. chim.* 42, 623-4 (1923).—The new test for quercitrin (I) follows: an aq. ext. of the fresh leaf or of the prep<sup>d</sup>. tea is prep<sup>d</sup>. and filtered. About 1-2% of the vol. of the soln. of concd.  $HCl$  is added and the mixt. boiled 1-2 hrs. under a reflux condenser while a vigorous stream of  $CO_2$  is passed in. The brownish ppt., composed mostly of a red decompn. product of tannin, is dried after thorough washing.

Quercetin (II) is extd. from the ext. with Et<sub>2</sub>O and purified by recrystn. from boiling H<sub>2</sub>O. II can also be dissolved in EtOH and ptd. by an aq. 1% NaCl soln. II is formed by the hydrolysis of I. All the leaves and tea examd. contained about 0.1%, regardless of whether the leaves grew in the shade or in the sun and regardless of how the tea was prep'd.

E. J. WIRZEMANN

**The utilization of the potato.** H. C. GORE. New Jersey State Dept. Agr., *Bull. 28*, 253-74(1921).—An address dealing with the possible methods of utilizing potatoes. The methods of manuf. of dehydrated potatoes, dried pressed potatoes for stock feed, alcohol, potato flour, and starch are outlined.

K. D. JACOB

**The process of panification according to the method proposed by E. Monti.** G. DROGOUL. *Staz. sper. agrar. ital.* 55, 303-17(1922).—The method consists in the sep. prep'n. of the crumb and crust from flours of different compn. Flour bolted to a 75% yield is used for the crumb. The bran from this flour (25%) is reground and bolted yielding fine bran (15-20%) and fibrous integuments composed mostly of partially lignified cellulose (5-10%). Enzymes or acids, preferably grape juice and the whey of sour milk of 1/2% acidity, are made to act upon the fine bran. The juices of fruits in a state of incipient fermentation and acidulated with approx. 1% lactic, tartaric, acetic or hydrochloric or other mineral acid which completely decomposes or volatilizes during the baking of the bread may also be used or simply H<sub>2</sub>O acidulated with HCl or tartaric acid. The crust is made from the reground fine bran thus treated. Two methods for the prep'n. of the loaves are described; the method by stratification and the method by remixing. Microchem. examn. of the natural fine bran, the crust obtained from the fine bran treated with HCl and the crust from fine bran treated with pure H<sub>2</sub>O by means of Vétillard's reagent and Zn chloroiodide shows lignocellulose to predominate in the natural bran and cellulose in the crust from HCl-treated bran and that there is partial scission of the lignocellulose in the crust treated with pure H<sub>2</sub>O. Chem. investigations show that a scission of the lignified matter takes place in the fine bran which is subjected to the action of acids and enzymes with the formation of free cellulose and hemicellulose so that the indigestible matter is totally or partially decomposed to yield more simple carbohydrates which are easily attacked by the digestive juices of the stomach. Consequently the Monti method is a rational system of panification which permits the prep'n. of bread of excellent taste from flour bolted to a 90% yield.

ALBERT R. MERZ

**The bread tree.** J. PIERAERTS. *Bull. agr. Congo Belge* 14, 452-9(1923).—Chem. analyses of products of the bread tree are given. Flour prep'd. from the seed resembles banana flour.

M. S. ANDERSON

**Variation of protein content of corn.** H. B. ARBUCKLE AND O. J. THIIS, JR. *J. Elisha Mitchell Sci. Soc.* 39, Nos. 1 and 2, p. 58-62(1923).—Report giving analyses. No conclusions.

H. W. EASTWOOD

A comparison of early, medium and late maturing varieties of silage corn for milk production. Report of second feeding trial. WM. L. SLATE, JR., BENJAMIN A. BROWN, GEORGE C. WHITE and LEROY M. CHAPMAN. *J. Dairy Sci.* 6, 382-92(1923).—Groups of cows in their first five lactation months were taken for experimentation over a 100-day period following a 40-day preliminary stage. The animals received const. quantities of silage and hay. Sufficient grain was fed to maintain const. wt. To produce one lb. of milk with 12% solids the silage required was 3.5 lb. of early, 4.2 lb. of medium and 5.4 lb. of late. However, since the later varieties of corn gave a considerably larger yield per acre, larger quantities of milk were produced from a given area than with early maturing corn.

FRANK E. RICE

**Nutritive value of the Georgia velvet bean (*Stizolobium deerinianum*).** J. W. READ AND BARNETT SURE. *J. Agr. Research* 24, 433-9(1923).—The velvet-bean seed (cooked) when fed at a level of 60% together with 40% dextrin, and velvet-bean hay (whole plant) when fed at a 40% plane of intake together with 60% starch, supplement milk as a food for the albino rat in a manner satisfactory for growth and reproduction. The Georgia velvet-bean leaf is abundant in the B vitamin and contains salts of excellent biol. value. The bulls have no supplementary value and interfere with the utilization of the A vitamin in the seed. Autoclaving for 2 hrs. at 15 lb. pressure did not change their disturbing effect.

W. H. ROSS

**Preservation of fodder.** I. So-called sweet silage. G. WIEGNER, E. CRASEMANN AND J. MAGASANIK. *Landw. Vers. Stat.* 100, 143-268(1923); *J. Soc. Chem. Ind.* 42, 570A.—Animal feeding expts. and chem. examn. with silage prep'd. in a number of different ways are described and compared with ordinary hay crops. Percentage of free volatile acids in fresh silage and in the air-dried materials increased with the amt. of water present. The reverse was true with free non-volatile acids. The higher the amt. of crude fiber in silage, the smaller was the percentage of amides and the lower the

**protein digestibility.** The percentage of free total acids decreased with decreasing water content. Free volatile acids increased with the crude fiber content. A comparison is made of two silage stacks; one had a good draught and a moderate pressure while the other one had poor ventilation and a low pressure. The chemical differences are recorded.

F. M. SCHERTZ

**The pigeon pea (*Cajanus indicus*).** Its cultivation and utilization in Hawaii. F. G. KRAUSS. Hawaii Agr. Expt. Sta., *Bull.* 46, 23 pp. (1921).—The pigeon pea (*Cajanus indicus* or *C. cajan*) is being grown extensively as a valuable stock food and green manure in Hawaii. The av. percentage compn. of pigeon pea products is given in the following table:

Character of material	Carbohydrates—						Crude protein
	H <sub>2</sub> O	Ash	Crude fiber	N free Ext.	N	Fat	
Fresh green forage <sup>1</sup>	70.00	2.64	10.72	7.88	1.13	1.65	7.11
Whole plant cured as hay							
and ground into meal	11.19	3.53	28.87	39.89	2.37	1.72	14.83
Seed and pod meal	11.45	3.85	30.73	34.53	2.82	1.49	17.65
Seed meal	12.26	3.55	6.41	53.91	3.57	1.46	22.31
Thrashed pod meal <sup>2</sup>	13.30	2.66	35.44	39.22	1.40	1.03	8.75

<sup>1</sup> Upper third of plant with seed in pod.<sup>2</sup> By-product in seed production.

The plants are adapted to wide variety of soils and appear to be tolerant of salty soil conditions. Plants thrived in soils contg. 0.0005 g. NaCl per g. of soil, twice this amt. dwarfed their growth and they were killed by 0.005 g. NaCl per g. of soil. Methods of planting the seed, harvesting and curing the hay, and prepns. of various stock foods are described.

K. D. JACON

**Yellow versus white maize as food for stock.** H. WENHOLZ. *Agr. Gaz. N. S. Wales* 33, 851-4 (1922).—In the absence of ready access to pasture or green food, yellow maize, because of its content of vitamin A, is a more efficient stock food than white maize, which contains practically none of this substance.

K. D. JACON

**The fodder value of maize stover.** F. B. GERNER. *Agr. Gaz. N. S. Wales* 33, 58 (1922).—Analyses of samples of maize stover gave H<sub>2</sub>O 9.09, 9.23, albuminoids 4.37-6.62, ether ext. 0.33-0.39, ash 5.65-8.52, fiber 22.27-32.39, carbohydrates 45.78-55.36%; albuminoid ratio 1:7 to 1:12.8, nutritive value 53.14 to 60.6.

K. D. JACON

**Some useful saltbushes.** E. BREAKWELL. *Agr. Gaz. N. S. Wales* 33, 571-7 (1922); cf. *C. A.* 16, 3985.—The value of the saltbush as a stock food is pointed out and several species common to N. S. Wales are described. Analyses of 6 varieties gave: H<sub>2</sub>O 75, ash 4.15-12.16, albuminoids 2.87-9.12, crude fiber 2.27-5.47, carbohydrates 3.68-9.59%, ether ext. 0.38-1.03%, albuminoid ratio 1:1.2-1:2.8, nutritive value 8.4-19.8.

K. D. JACON

**Sunflowers—their culture and use.** A. F. VASS. Univ. Wyoming Agr. Expt. Sta., *Bull.* 129, 79-107 (1921).—Chem. analyses of sunflower silage show the food constituents to be similar to those of corn silage. Indications are that the feeding values of the 2 are much the same also.

M. S. ANDERSON

**Sunflower investigations.** RAY E. NEIDIG AND ROBERT S. SNYDER. *J. Agr. Research* 24, 769-80 (1923).—Analyses are given of sunflower plants harvested at various stages during growth, and when grown under spacings of 4 to 8 in. and 36 in. apart in the row. The plants grown under the 2 systems of planting were compared for the percentages of leaves, stalks, stems and flowers, and analyses were made of composite samples of each of these plant parts. The compn. of the silage made from the sunflowers cut at each of the stages of maturity and from each of the 2 different spacings of plants in the row was also detd. No consistent variations were noted under the 2 systems of plantings in the ratios of leaves, stalks and flowers and no gain in crude fiber occurred during the growth of the sunflower plant throughout the 5 stages of maturity included in this investigation.

W. H. ROSS

**Sweet clover investigations.** RAY E. NEIDIG AND R. S. SNYDER. *J. Agr. Research* 24, 795-9 (1923).—A detn. of the compn. of white and yellow sweet clover at different stages of growth showed that the N or crude protein decreased and the crude fiber increased the longer the plants were allowed to grow. Silage prepnd. from sweet clover was found to contain the characteristic acids produced under normal silage fermentation, and the product obtained was of excellent quality.

W. H. ROSS

**The use of nettles in the feeding of chickens.** AUGUSTO MOLLO. *Staz. sperimentale agraria, Ital.* 55, 490-6 (1922).—Air-dried nettle leaves, contg. some tender stalks, analyzed after oven-drying at 100°: H<sub>2</sub>O 13.5, nitrogenous matter 14.5, crude fat 6.7, crude fiber

12.2, non-nitrogenous ext. 46.3, ash 15.8%. The ash contained 28.6% CaO and 1.6% P<sub>2</sub>O<sub>5</sub>. Comparative feeding expts. show the nettles to be superior to clover in nutritive value and influence on the development of chicks.

ALBERT R. MERRZ

Standards of purity of olive oil (SAGE) 27. Aroma-producing microorganisms (OMELIANSKI) 11C. Effect of acidification on toxicity of *B. botulinus* toxin (GÄGGER, GOUWENS) 11C. Utilizing waste products (Brit. pat. 195,911) 16. Producing oxides of N (for flour manufacture) (Brit. pat. 196,697) 18.

Stable emulsions of edible oils. E. E. AVRES, JR. U. S. 1,467,081, Sept. 4. Cocoanut oil or other edible oil is warmed and stearin is dissolved in it, the mixt. is cooled and a portion of the dissolved stearin thereby ptd. The product of the cooling is then emulsified with H<sub>2</sub>O, milk or other aq. liquid to prep. an emulsion which is stable.

Churning and emulsifying apparatus for margarine manufacture. E. STEEN-BERG. U. S. 1,468,581, Sept. 18.

Pasteurizing whey. R. O. STEARNS and D. E. McGRAW. U. S. 1,468,420, Sept. 18. Whey or skimmed milk is broken up into finely divided particles which are subjected to the action of steam to pasteurize them without vaporization.

Apparatus for evaporating milk or other liquids. H. E. COLLVER. U. S. 1,466,579, Aug. 28. Blades of yieldable metal are carried on a central vertical rotatable shaft so that they contact with the inner surface of a vertical evapg. chamber with a heating jacket.

Amylolytic products; food preparations. A. E. ALEXANDER. Brit. 198,009, Feb. 14, 1922. A substantially dry starch material is heated in presence of a hydrolyzing agent to a temp. of about 325° F. to produce a compn. having a sugar content ranging between 6 and 13%, and contg. also other products of amylolysis, together with some unaltered starch. In an example, powd. and substantially dry starch is treated with about 0.5% by wt. of pure HCl previously diluted to about 10° Bé. The mixt. is heated to 325° F. in a steam-jacketed converter provided with agitating means and maintained at that temp. for about an hr. Regulation of the heating so that the moisture present in the mixt. is evapd. before conversion begins is stated to improve the color of the product. The product may be mixed with wheat or other flour in various proportions and used in the manuf. of bread.

Food for animals. J. LEWIS. Brit. 198,304, Dec. 8, 1922. Poultry and animal foods in granular or powd. forms are manufd. from household waste, condemned foods etc., by a process in which some fat and moisture are extd. by centrifugal app. in conjunction with wet steam, the food being afterwards dried by air or superheated steam at a high temp. and low pressure. The material is sorted out on a sorting table and disintegrated and then passed into a centrifugal extractor into which wet steam is injected. From the extractor it is elevated to the drier, where it comes into contact with steam or air at a temp. of about 800° F. A low pressure is maintained in the drier and the cooked and sterilized material is discharged from it at a temp. of about 240° F. after having remained in it about 35 min. The material is then cooled and afterwards screened to sep. the granules, the remainder being crushed or ground. It is stored for a time before packing. A mixing-drum may be employed between the centrifugal extractor and the drier.

Maple syrup mixture. C. F. WALTON, JR. and H. S. PAYNE. U. S. 1,467,022, Sept. 4. A sirup of high density is obtained by treating maple syrup with invertase to produce partial inversion of the sucrose in the maple syrup.

Concentrating or evaporating fruit juices, essences or other liquids. E. MONTI. U. S. 1,466,670, Sept. 4. A suitable gaseous medium is compressed to heat it and is brought into heat exchanging contact with the liquid to be fractionated or evapd. to volatilize the more readily volatilizable portions and afterward is allowed to expand in heat exchanging contact with the volatilized material to effect its condensation. Alc. mixts. may be treated in this manner to sep. their constituents.

Sterilizing almonds with steam. G. W. PIERCE. U. S. 1,465,829, Aug. 21. Almonds are treated with steam while being passed through a rotating agitating cylinder.

Pulp board. A. TINGLE. U. S. 1,465,882, Aug. 21. Pressed pulp sheets mainly formed of lignocellulose have their superficial portions parchmentized and coated with varnish, to adapt them for manuf. of containers for foods.

## 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**American Society for Testing Materials standards adopted in 1923.** *Pamphlet* 126 pp. (1923).—Specifications are given for hard-drawn Cu wire, pig Pb, Cu pipe, brass pipe, clay sewer brick, perilla oil (raw or refined), block for recut granite block pavements, block for Durax granite pavements, broken slag for water-bound base and wearing course, shovel-run or crusher-run broken slag for water-bound base, cotton rubber-lined fire hose, rubber gloves for elec. workers and rubber pump valves. Standard methods are given for the analysis of Ni, of brass ingots and sand castings, of bronze bearing metal and of yellow and orange pigments contg. Cr compds., blue pigments and chrome green. Standard testing methods given, cover gypsum and gypsum products, fusibility of coal ash and a shatter test for coke. E. J. C.

**Some practical notes on filter-press manipulation.** "C. C. D." *Pharm. J.* 110, 588 (1923).—Methods of washing are discussed, especially for the case when the weak wash liquors are not joined to the filtrate to be evapd., and are removed by a special outlet involving a special design of the filter press. S. WALDBOTT

**Distilling column elements.** J. A. STEPPENS. *Chem. Age* (N. Y.) 31, 75-6 (1923).—An elementary description and non-mathematical discussion of processes and equipment for fractional distn. E. H. LESLIE

**Supplemental theory of fine grinding.** A. T. FRY. *Chem. Eng. Mining Rev.* 15, 388-94 (1923).—In grinding material in a ball mill it was discovered that at a certain point of time a very marked loss in efficiency occurred. This is intimately related to the angle of nip (approximately 30°), as in the case of roll crushing. For a given diam. of flint one can calc. the diam. ( $d$ ) of the contact area which would result were the feed composed of a particular size ( $P$ ), and for a given number of flints of a certain av. diam. the available contact area for crushing depends on the size of the feed particles available up to the max. permitted by the angle of nip. Thus, the max. diam. of particle nipped (angle of nip = 30°),  $P = 0.07R$ , where  $R$  = radius of the flint; and the diam. of the contact area,  $d = 2(\sqrt{RP} + (P^2/4) - 0.00907 R)$ . As the contact area is diminished the energy of impact will be concn. on an area too small to hold sufficient rock to absorb the energy efficiently in the resulting comminution; therefore, the smallest effective flints should be used, and still smaller steel balls may be preferable. Exptl. results are reported showing the relationships among above factors, energy consumption, etc. W. C. ERAUGH

**High-speed stirring as an aid to chemical action.** C. H. MILLIGAN AND E. E. REID. *Ind. Eng. Chem.* 15, 1048-9 (1923).—The relation of the speed of stirring to the velocity of a reaction is studied by means of (1) the ethylation of  $C_6H_6$  in the presence of  $AlCl_3$  and (2) the hydrogenation of cottonseed oil in the presence of Ni. The rates of both reactions could be expressed by the relation:  $v = a + br$  where  $v$  is the rate of gas absorption,  $a$  the rate when the gas was bubbled through without stirring,  $b$  a const. for the stirrer and  $r$  the speed of stirring. In reaction (1)  $a$  had a positive value, since the gas was sol. in the liquid. In (2)  $a$  was negligible since the absorption of H increased faster than the rate of stirring at low speeds, though at higher speeds the relation became linear. The app. is described and the results are shown graphically. C. C. DAVIS

**A new process for the purification of gases and vapors.** B. STACH. *Z. Ver. deut. Ing.* 65, 1285-7 (1921).—An illustrated description of the *rotary filter process* of Freytag-Metzler. A much greater degree of purity in the removal of dust, tar, oil, etc., from gases can be obtained than by any previous process. It consists essentially of a slowly revolving filter which surrounds a rapidly rotating fan on the same axis. Through this fan the gas enters the filter. The actual filtering app. is a hollow drum which is sep'd. into individual compartments and rotates on shoulders of the outer jacket. The r. p. m. of the filter can be varied over a wide range, depending on the impurities to be removed. The filtering mixt. with which the compartments are charged and the washing liquid depend upon the type of impurity to be removed and may consist of steel borings, metal gauze, etc., with  $H_2O$  or other liquid. The process can be used for the purification of gases from blast furnaces, Cu, Sn and Zn furnaces, the cement industry, coke oven, producers, for removing oil from steam, as an absorption process, etc. Data are given of results in the *purification of coke-oven gas*. C. C. DAVIS

**Control and prevention of tetrachloroethane poisoning.** D. C. PARMENTER. *J. Ind. Hyg.* 5, 159-61 (1923); cf. *C. A.* 15, 1782; 16, 753.—A consideration of the blood of persons exposed to  $C_2H_2Cl_4$  fumes, and the interpretation of the blood picture are of the utmost importance, and serve in nearly all cases not only to det. susceptibility to

the fumes, but also to prevent poisoning and, to a great extent, malaise which results in depreciated industrial efficiency. Aside from one or two easily recognized types of exceptions, the blood picture and the symptoms, which in the early stages are almost wholly gastric and general, follow nearly parallel lines. These observations, together with the original conclusions in regard to the use of  $C_2H_2Cl_4$ , seem to emphasize anew the entire feasibility of employing the substance commercially, provided that proper precautions are taken and that use is made of the present available medical knowledge on the subject.

L. W. RIGGS

Use of stoneware in chemical industry (MÜLLER) 19. The heat transfer number of Nusselt and its valid range (SCHACK) 2. Absorption of lead by the upper respiratory passages (BLUMCART) 11H.

**Purifying liquids.** J. N. A. SAUER. Brit. 198,374, May 26, 1923. A modification of the process described in 183,485 (*C. A.* 17, 161) consists in treating the liquid simultaneously or successively with externally ptd. lime salts and with some other purifying medium such as decolorizing C, bone charcoal, blood charcoal, kieselguhr, fuller's earth, kaolin, or silicic acid. Liquid to which these materials have been added may be heated and the materials subsequently removed by filtration. The process is applicable in the treatment of sugar solns., glucose, invert sugar, vegetable and fruit juices, glycerol, water, oils, fats, benzine and petroleum. The treatment may be followed by a chem. treatment, e. g., treatment with lime and satn. with  $CO_2$  or  $H_2SO_4$ .

**Purifying liquids.** NAAMLOOZE VENNOOTSCHEAP ALGEMEENE NORIT MAATSCHAPPIJ. Brit. 198,366, May 25, 1923. Addn. to 163,505. The process described in the principal patent, and in 172,962, is modified in that during the mech. sepn. of the purifying agent from the filter surface the pressure difference which drives the liquid through the filter is wholly or partly removed or a pressure is applied in the opposite direction. A suitable construction is specified.

**Clarifying liquids.** D. STEWART & CO., LTD. Brit. 194,948, April 3, 1922. Liquid, such as sugar juice, which has been raised to a high pressure and temp. to coagulate albumins which are to be removed by filtration is brought to normal pressure and a corresponding temp. by stages during which the vapor liberated escapes freely, so as to avoid breaking up the coagulated masses. A suitable construction is specified.

**Aerating liquids.** J. McWHIRTER. Brit. 196,227, Sept. 15, 1922. Liquid to be aerated is mixed with a certain quantity of gas in an injector device and then sprayed into a chamber contg. more gas.

**Aerating liquids.** O. A. ILIAS. Brit. 197,499, April 10, 1922. Water is aerated with A or other gases of the A series under pressure, preferably mixed with  $CO_2$ . The gases are mixed before passing to the aerating app. A suitable app. is specified.

**Decolorizing liquids.** A. C. CUMMING and KIARIT, LTD. Brit. 196,002, Oct. 14, 1921. "Carbon-black" substantially free from oil is used for decolorizing *fats*, *oils*, *sugar solns.*, and other liquids. Solid adsorbents such as kieselguhr or china clay may be mixed with it. The "carbon-black" may be freed from oil by heating to redness out of contact with hydrocarbons. Cf. 25,571, 1899.

**Concentrating liquids.** W. VOGELBUSCH. Brit. 196,935, April 28, 1923. In evapg. liquids, such as NaOH soln., the liquid, passing downwards through a series of heating elements, is passed between each heating element on to shelves in the evapg. chamber. A suitable construction is specified.

**Purifying liquids and gases with activated carbon.** J. N. A. SAUER. Brit. 198,373, May 26, 1923. The liquid or gas to be purified is subjected to the action of a plurality of active carbons possessing different phys. and physico-chem. properties and so chosen that they supplement one another in their action. The different types of C may be employed in admixt. with one another or consecutively. Six types of activated C are distinguished.

**Treating liquids with gases.** A. H. SHAW and PEACHEY PROCESS CO., LTD. Brit. 197,368, Feb. 6, 1922. In the impregnation of liquids or solns. with sol. gases, the liquid descends in fine streams in a closed vessel into which the gas is introduced, the flow of liquid being adjusted in such a manner that, by this adjustment, the capacity of the closed vessel is appreciably increased or decreased as the flow of liquid is increased or decreased. A suitable construction is specified.

**Separating vapors from gases.** J. CROSFIELD & SONS and H. J. WHEATON. Brit. 196,646, Nov. 29, 1921. Vapors, such as those of gasoline, benzene and other volatile org. compds., or  $H_2O$  vapor in the case of moist air, are sep'd., and when necessary recovered, by passing the air or gas over or through a base-exchanging silicate contg. as

base an alkali metal, with or without another metal or other metals; the silicate is first washed until it becomes porous, and is then dried at a temp. which will not injuriously affect its phys. structure, a suitable temp. being from about 150 to 400°. Suitable silicates are those the prepn. of which is described in 142,974 and 177,716, whether or not they have been previously used in the purification of H<sub>2</sub>O. After use, the absorbent is brought into its original condition by heating to temps. of 150 to 200°, if necessary, with the application of reduced pressure.

**Separating liquids and gases.** CRISCOM-RUSCHE CO. Brit. 196,238, July 5, 1922. Dissolved gases are removed from *bather fed water* or other liquid by heating the liquid in a container, and means is provided for lacozing the scale deposited on the heating app. A suitable app. is specified.

**Separating gaseous mixtures.** NAAMLOOZE VENNOOTSCHAP PHILLIPS' GLOEI-LAMPENFABRIEKEN. Brit. 195,560, July 19, 1922. A gaseous mixt. is sep'd into its components by causing it to diffuse into or against an auxiliary stream of gas or vapor, and by withdrawing portions of the auxiliary stream in which, on account of the different diffusibilities of the components of the mixt., the concn. of one or the other of the components is relatively high. The auxiliary stream flows at a regulable rate and is readily separable from the admixed component. The invention is illustrated by reference to the sepn. of He and Ne from a mixt. of the two.

**Separating gaseous mixtures by liquefaction.** SOC. L'AIR LIQUIDE, SOC. ANON. POUR L'ETUDE ET L'EXPLOITATION DES PROCEDES G. CLAUDE. Brit. 195,950, March 15, 1923. A process for the sepn. by partial liquefaction of mixts. contg. H, such as H<sub>2</sub>O, illuminating, or coke-oven gas, comprises the vaporization of the liquefied portion at a pressure above atm. and the expansion with external work of the gaseous product, the refrigerative effect of the expansion producing liquefaction at a temp. below the vaporization temp.; the H thus obtained may be expanded without external work. A suitable app. is specified. Cf. C. A. 17, 3755.

**Separating gases by liquefaction; engine valves.** SOC. L'AIR LIQUIDE, SOC. ANON. POUR L'ETUDE ET L'EXPLOITATION DES PROCEDES G. CLAUDE. Brit. 197,302, March 14, 1923. In the sepn. of the constituents of a gaseous mixt. by liquefaction and rectification, the cold produced by the expansion of a gas with external work is conducted directly to the chamber in which liquefaction and rectification take place through the wall of the expansion chamber which seps. it from an annular rectification chamber surrounding it, and the admission and exhaust of gas to and from the cylinder may be effected by a valve actuated by pneumatic or electromagnetic means or a combination of both. A suitable construction is specified.

**Recovering volatile solvents.** H. BOLLMANN. Brit. 196,746, Feb. 17, 1922. A mixt. of alc. and benzene which has been utilized for extg. oil from seeds or like processes and contains the oil and water to the amt. of 7.4% or less is heated in a still to a temp. of about 65° when the water, with some of the alc. and benzene, evaps., and is condensed in a condenser when it passes to a column. The liquid in the column seps. into two portions, the upper, consisting almost entirely of alc. and benzene, passing to a vessel and the lower, consisting of alc. and water, passing to a rectifying column. The alc. vapor is condensed in the condenser and returns to the column. The liquid remaining in the still passes to a second still where it is heated up to 90°. The alc. and benzene are driven off, condensed in a condenser and passed to the vessel while the oil remaining passes to a still where the last traces of solvent are driven off and pass to another column. Cf. C. A. 16, 2563.

**Refrigerating.** A. A. KUCHER. Brit. 195,943, March 1, 1923. In compression machines a lubricant is employed which is sol. in or forms a stable homogeneous mixt. with the refrigerant, and portions of the liquid soln. or mixt. are introduced into the stream of vapor drawn by the compressor from the evaporator, so as to maintain a circulation of lubricant. Preferably a halogen deriv. of the CH<sub>4</sub> group, such as EtCl, is used as the refrigerant and a mineral oil as the lubricant, a proportion of 1 part of oil to 4 parts of EtCl being suitable. Or colloidal C or graphite may be employed as a lubricant with EtCl. A suitable construction is specified.

**Heating processes.** H. MEHNER. Brit. 196,658, Jan. 17, 1922. A process for heating materials at high temps. in a furnace with a flame as the source of heat consists in interposing a layer of gas between the material and the flame so that radiant heat acts only on the charge. The gaseous layer may be formed by the gas or air supplied for combustion, or by other gas, which may be inert with respect to the process carried out in the furnace, or may take an active part. The method of heating is applicable for carrying out chem. reactions, such as the reduction of metallic Na from Na<sub>2</sub>CO<sub>3</sub>, for the distn. of fuel, the production of water gas and H, the manuf. of lime, the melting down of

filings and turnings, and other processes in which it is desired to prevent the products of combustion from acting on the charge. A suitable construction is specified.

**Heat-insulating material.** O. GERLACH. U. S. 1,468,149, Sept. 18. A gelatinous ppt. obtained by reaction of Na silicate on  $\text{Al}_2(\text{SO}_4)_3$ , is mixed, while still moist, with infusorial earth to form a heat-insulating material adapted for use in molded form.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW AND G. C. BAKER

**A medicinal water.** F. B. GUTHRIE. *Agri. Gaz. N. S. Wales* 33, 463(1922).—Analysis of  $\text{H}_2\text{O}$  from a creek in the Carcoar district gave per 100,000 parts: total solid residue 240, saline residue 195.4, loss on ignition 44.6, Cl 17.5, alky. calcd. as  $\text{Na}_2\text{CO}_3$  4.2, magnesia calcd. as  $\text{MgSO}_4$  174. The  $\text{H}_2\text{O}$  was odorless, of a saline taste, and the residue contained sulfates, Mg and small amts. of lime. K. D. JACOB

**Recent work on the problem of waste waters.** B. SIMMERSBACH. *Dinglers polytech.* J. 338, 105-9, 117-20, 131-5(1923).—A review and discussion, including various processes in use or patented. C. C. D.

**Report of Committee No. 1 on Standard Methods of Water Analysis.** E. M. CHAMOT, et al. *J. Am. Water Works Assoc.* 10, 860-5(1923).—Six changes covering culture medium, technic and app., have the approval of the committee. The discussion involves many of the reasons prompting such changes. D. K. FRENCH

**New water supply quality standard tentatively proposed by the U. S. Public Health Service.** ANON. *J. Am. Water Works Assoc.* 10, 884-921(1923).—The new bacterial standard limits permissible *B. coli* to not more than 10% of all 10-cc. standard portions examd., and not more than 3 out of 5 10-cc. tubes on each portion. The discussion is not entirely favorable to these stricter standards. D. K. FRENCH

**Lime in water-treatment plants.** W. D. COLLINS. *Rock Products* 27, No. 18, 55-7(1923).—A discussion of the widening field for the use of high-Ca lime in municipal, industrial and railroad plants to soften water and remove harmful bacteria. A "hardness of water" map of the U. S. is included. J. M. HOLDERBY

**Water purification.** L. T. GUY. *Commonwealth Eng.* 11, 35-7(1923).—Various methods of water purification and the growing need for water treatment in Australia are discussed. For the av. small Australian town coagulating-settling basins with automatic chem. control are recommended. J. M. HOLDERBY

**Iodine treatment of water for prevention of goiter.** B. C. LITTLE. *J. Am. Water Works Assoc.* 10, 556-8; *Eng. News Record* 90, 964-5(1923).—The Water Bureau and the Health Bureau of Rochester, N. Y., by adding I in the form of NaI to the water supply, will cure and prevent simple goiter. 0.0002 g. per gal. or 16 lbs. per day was added for 2 weeks in the spring, and the same dose will be repeated in the fall for a like period. D. K. FRENCH

**Some observations on mixtures of sea water and soft water.** A. MASSINK. *Rec. trav. chim.* 42, 605-8(1923).—The method of Precht has been applied to the study of the detn. of hardness of waters (Noll, *Z. angew. Chem.* 26, 320(1913)) to det. the proportions of a mixt. of sea and soft waters. Data show that the method gives satisfactory results. E. J. WITZEMANN

**Design of the proposed water-filtration plant at Baltimore.** J. W. ARMSTRONG. *J. Am. Water Works Assoc.* 10, 535-55(1923).—A complete description of the plans and details of operation of the proposed plant is given. It is planned to manuf. Hoover alum, purchasing the bauxite in carload lots, and the acid locally. Both liquid and cake alum will be made. Lime and liquid Cl will also be used. The chem. building where manuf., mixing and control will be carried on, is to be centrally located. There will be 2 coagulating basins, each about  $105 \times 380 \times 13\frac{1}{2}$  ft., also 2 filtered-water reservoirs with a combined capacity of about 27 million gallons. D. K. FRENCH

**Schoharie development of the Catskill water system of the city of New York.** J. W. SMITH. *J. Am. Water Works Assoc.* 10, 797-828(1923).—Descriptive of the progress in construction of this enormous development. D. K. FRENCH

**Taste and odor in the New York City's supplies.** F. E. HALE. *J. Am. Water Works Assoc.* 10, 829-37(1923).—The various organisms creating odor are characterized and listed as well as the methods used to eliminate them;  $\text{CuSO}_4$  is most generally used. D. K. FRENCH

**Melcroft coal company case.** F. H. SNOW. *J. Am. Water Works Assoc.* 10, 838-49(1923).—Summary of a case to det. the right to use a stream for the disposal of

mine wastes and the right to prevent such use, and thereby retain an improved water. No decision has been reached.

D. K. FRENCH

**Action of natural waters on lead.** J. C. THRESH. *Analyst* 47, 459-68, 500-5 (1922).—Pure water has no action on Pb but in the presence of O<sub>2</sub> action took place, PbO or Pb(OH)<sub>2</sub> being formed, and the Pb remaining in soln. in a colloidal form, the sol also becoming alk. In pure H<sub>2</sub>O satd. with O<sub>2</sub> the oxidizing action continues until all the O<sub>2</sub> is used up. If more hydroxide is formed than can be held by the H<sub>2</sub>O, it is deposited in a semi-cryst. condition. When, besides O<sub>2</sub>, H<sub>2</sub>CO<sub>3</sub> is present, Pb forms a carbonate, bicarbonate, or oxycarbonate. The effect of temp., agitation, and the difficulty in detg. such small amts. of Pb as are present are referred to. In water, with  $\rho_{\text{H}} 7$  Pb may occur in mol. condition and be capable of accurate estn. With  $\rho_{\text{H}}$  less than 7 a portion of the Pb at least is in a colloidal condition. The  $\rho_{\text{H}}$  values may be estd. by indicators. Drinking waters are classified according to the H-ion concn. into: (1) those which contain CO<sub>3</sub><sup>2-</sup>, and HCO<sub>3</sub><sup>-</sup>, (2) those that contain free H<sub>2</sub>CO<sub>3</sub>, possibly HCO<sub>3</sub><sup>-</sup> but no CO<sub>3</sub><sup>2-</sup>, and (3) those with no CO<sub>3</sub><sup>2-</sup> nor HCO<sub>3</sub><sup>-</sup> but with a free acid besides H<sub>2</sub>CO<sub>3</sub>. With HCl and NaCl it was found (1) that chlorides do not retain the PbCO<sub>3</sub> in soln., (2) they do not retard the oxidation of the metal, and (3) they do tend to cause a deposit of an insol. chloride. Sulfates deposit PbSO<sub>4</sub> but have no marked effect in retarding the rate of oxidation unless present in large quantities. Also they do not retain the Pb in soln. CO<sub>3</sub><sup>2-</sup> and HCO<sub>3</sub><sup>-</sup> oxidize the Pb and form insol. coatings which, when the deposit becomes sufficiently thick, resist further action by the water. Free acids and their salts do not appear to have any effect upon the Pb if present in small quantities. Citric, tartaric, and quinic acids seem to prevent the pptn. of PbCO<sub>3</sub> in waters contg. CO<sub>2</sub>. Silicic acid and silicates have a marked property in retarding oxidation and in preventing the Pb from passing into the soln. Alk. silicates are several times more powerful than silicic acid. In part II, the characteristic properties of natural waters are discussed. Na<sub>2</sub>SiO<sub>3</sub> being cheap, in liquid form, and hence easily handled, is of the greatest advantage and should become of great importance in practice.

E. F. PERKINS

**Water deactivation.** F. N. SPELLER. *Proc. Eng. Soc. Western Penn.* 39, 189-201 (1923); cf. *C. A.* 16, 2844.—The corrosive properties of most waters are directly proportional to the dissolved O content. The rational method of deactivation is to remove the dissolved gases. Several methods for O removal are described. J. M. HOLDERREY

**Prevention of corrosion in hot water supply systems and boiler economizer tubes.** C. R. TENTER. *J. Am. Water Works Assoc.* 10, 764-72 (1923).—O and water are considered the principal causes of corrosion, and chem. and mech. methods of O removal as well as "deactivation" with steel scrap are referred to. Reference is made to recent work with sol. silicates in connection with a so-called "self-healing" protective film produced through pptn. of the silicates by colloidal Fe, etc., to form an impervious film which protects the metal. This type of protection applies only to small systems.

D. K. FRENCH

**Report of Committee No. 2 on Revision of Standard Specifications for Cast Iron Pipe and Special Castings.** F. A. BARBOUR, et al. *J. Am. Water Works Assoc.* 10, 866-70 (1923); cf. *C. A.* 17, 803.—Purely physical. D. K. FRENCH

**Laboratory control of water supplies and sewage treatment in the large cities of the U. S. in 1920.** IRA V. HISCOCK. *J. Am. Water Works Assoc.* 10, 872-9 (1923).—While treatment plants are under close lab. control, a greater standardization of technic in some labs., and better systems of recording and transmitting results are needed.

D. K. FRENCH

**Sanitation generally, with particular reference to small towns.** MONTGOMERY NELSON. *Commonwealth Eng.* 11, 39-41 (1923).—The use of settling tanks and oxidizing filters are discussed. Septic action is objected to and settling tanks to produce an oxidized effluent are proposed. J. M. HOLDERREY

**The recovery of oil and fat from waste waters.** PAULSEN. *Rauch u. Staub* 13, 5-6 (1923).—A brief description of processes used in certain German cities. C. C. D.

**Atmospheric particulate matter. II.** The use of electric precipitation for quantitative determinations and microscopy. PHILIP DRINKER, R. M. THOMSON AND S. M. FITCHET. *J. Ind. Hyg.* 5, 162-84 (1923); cf. *C. A.* 17, 3559.—The theory of high-tension elec. pptn. is discussed with a view particularly to the construction and operation of small precipitators for the quant. detn. of smokes, fumes and dusts in the air. The flocculating and pptg. actions of a. c. and d. c. are compared, and a precipitator involving neither mech. nor valve rectifiers is described in detail. The ease with which elec. precipitators can be overloaded and, at the same time, work at less than max. efficiency is pointed out, and is shown to vary markedly with the size and no. of particles passing

through the electrostatic field. It is shown that the distribution of the ppt. offers a convenient and simple field test for overloading. Quant. pptn., as indicated by the Tyndall light beam test and by the distribution of the ppt. on the electrode, can be obtained by using a Pyrex glass collecting electrode and a fine wire or stiff rod for the pptg. electrode. Lining the tube with a thin transparent foil, such as celluloid, which may be readily withdrawn after a run, makes it possible to take photographs of the pptd. matter. All the evidence obtained indicates that true pptn. and not flocculation occurs, and that complete rectification in small-scale app. is unnecessary. In this study, particulate matter is classified as dusts in which the particles are larger than 10 microns, clouds in which the particles range from 10 to 0.1 micron, and smokes with particles ranging from 0.1 to 0.001 micron.

L. W. RIGGS

Anaerobes from water samples (MEADER, BLISS) 11C. Iodine in natural waters in relation to goiter (MCCLENDON) 11G. Separating liquids and gases (Brit. pat. 196,238) 13.

**Water purification.** W. F. LANGBLIER. U. S. 1,465,137, Aug. 14. Water or sewage to be purified is treated with a sol. Al salt such as  $\text{Al}_2(\text{SO}_4)_3$ , and with sufficient HCl,  $\text{H}_2\text{SO}_4$ , or other acid to give a pH which will assist coagulation and sedimentation.

**Sterilizing water.** L. J. G. CARROL. Brit. 197,336, May 3, 1923. Water flowing through an aqueduct is sterilized by the addn. of a soln. of hypochlorite by a pump operated by a water-wheel in the main stream. A suitable construction is specified.

**Softening water.** G. G. HEPBURN. Brit. 197,851, June 20, 1922. Peat, after treatment with NaOH or  $\text{Na}_2\text{CO}_3$ , or  $\text{NaHCO}_3$ , as described in the principal patent, is dried before being used, as before (*C. A.* 16, 1476) to soften water.

**Combined water-softening and storage tank.** C. LADD and T. G. WINDES, JR. U. S. 1,466,053, Aug. 23. A  $\text{H}_2\text{O}$ -softening app. is mounted within a storage tank.

**Treating sewage.** BRITISH DYESTUFFS CORPORATION, LTD., T. H. FAIRBROTHER AND A. RENSHAW. Brit. 196,754, Feb. 24, 1922. In the treatment of sewage by tank aeration processes, the sludge in the tanks is revivified by mixing it with dyestuffs of the oxazine class, such as Moldola Blue, Nile Blue, and the Et deriv. corresponding to Meldola Blue, to which some other basic dye such as Auramine O may be added. The dye is used in such quantity that certain protozoa are destroyed while the useful bacteria are uninjured.

**Treating sewage sludge.** MACLACHLAN REDUCTION PROCESS CO., INC. Brit. 196,239, July 12, 1922. Activated or other sludge is treated with  $\text{SO}_2$  which may be mixed with steam. The treated sludge is coned, by settling and by means of filter-presses or centrifugal app., or by draining on sand beds. The product, when dried, is suitable for use as fertilizer.

**Treating sewage sludge.** T. RICBY. Brit. 196,637, Oct. 28, 1921. Sewage sludge is dried by evapn., for use as fertilizer or as a preliminary step in the extn. of grease, while presenting an extended surface as a film on a heating surface or dispersed in a current of hot gas; matter which would hinder the formation of such extended surface is previously sepd. from the sludge. The sludge may be dried as a film in app. as described in 149,055, 180,963 (*C. A.* 17, 842), and 181,035, the vapor given off by the film being used for further drying.

**Plant for treating activated sludge.** W. J. SANDO. U. S. 1,465,001, Aug. 14. Waste heat from a power plant connected with the sludge system is used for heating sludge. Pptd. solids are filtered out for use as a fertilizer.

**Garbage incineration.** F. H. COLLINS and M. L. PELLETT. U. S. 1,468,137, Sept. 11. Garbage is burned in a furnace and hot gases of combustion from the furnace are passed through a mass of raw garbage outside the furnace to dry it, after which it also is fed to the furnace. Gases from the drying operation are drawn off, clarified and then delivered to the furnace to burn with the previously dried garbage. Oils, fats and potash values may be recovered.

**Garbage incinerator.** M. A. KOHN. U. S. 1,468,450, Sept. 18.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Studies in West Indian soils. II.** The soils of Montserrat, their natural history and chief physical properties, and the relationship of these to the problem of die-back of lime trees. F. HARDY. *West Indian Bull.* 19, 189–213(1922); cf. *C. A.* 16, 778.—

According to their geological origin the soils of Montserrat may be divided into 2 main types—talus soils and shoal soils. The talus soils are distributed over those areas where talus slopes occur and are featured by their marked porosity. They are light, fawn-colored, loamy sands notably deficient in colloidal matter (10 to 16%), and for this reason not very retentive of H<sub>2</sub>O (max. H<sub>2</sub>O-holding capacity 30 to 50%). The addn. of bulky org. fertilizers is the only practical means of increasing their H<sub>2</sub>O holding capacity. The talus soils are highly fertile and are distinctly alk. ( $p_H$  7.2 to 7.3) despite the presence of only small amt. of carbonates. The shoal soils occur in the areas where talus slopes are absent and constitute the major portion of the uncultivated land of the island. They are typical sedimentary soils derived from consolidated fragmental rocks which they usually directly overlie. The shoal soils are subdivided into: (1) humid upland soils which are markedly acid in reaction ( $p_H$  6.7), of a reddish or yellowish color showing the presence of excess Fe<sub>2</sub>O<sub>3</sub>, distinctly colloidal in type (20 to 40%), possess high H<sub>2</sub>O-holding capacities (50 to 60%), and low permeabilities; (2) hilly land soils which are practically neutral and have lower colloidal content than the humid upland soils; and (3) valley soils which are more fertile than the other types of shoal soils and have phys. properties similar to the hilly land soils. No definite relation could be established between the phys. and chem. properties of the soils and die-back of lime trees but it is thought that the chief factors responsible for die-back are intimately connected with the H<sub>2</sub>O relations between the lime trees and their environment. A list of 28 references to the literature is given.

K. D. JACOB

**Notes on some analytical methods.** H. F. L. BISCHOFF AND B. DE C. MARCHAND. *J. S. African Chem. Inst.* 6, 53-60 (1923).—In detg. available potash in soils it is customary to shake a large sample with 1% citric acid, evap. to dryness, ignite, digest with HCl, add CaCO<sub>3</sub>, if necessary, evap. again and once more ignite. Expts. indicate that there is no loss of K during this treatment. In detg. citric-sol. P<sub>2</sub>O<sub>5</sub> in basic slag, expts. show that considerable variations in the time of shaking, type of shaker and vol. of soln. can be made without much influence upon the final result. Fine grinding previous to detg. the soly. of bone and rock phosphate in citric acid has a marked effect upon the amt. of P<sub>2</sub>O<sub>5</sub> dissolved and this practice should be prohibited. W. T. H.

**Method to be used in taking samples of soil for analysis.** ANON. *J. Dept. of Agric. of S. Australia* 26, 875 (1923).—Detailed directions are given. M. S. A.

**Experiments with raw rock phosphates.** L. J. COOK. *J. Dept. Agr. S. Australia* 26, 1065-8 (1923).—Fertilization studies with local rock phosphates showed that the Al rock gave slightly better results with grasses than the Ca rock. M. S. ANDERSON

**Comparative study of some methods of chemical analysis of humus in soils.** V. AGAFONOFF. *Compt. rend.* 177, 404-6 (1923).—C detns. on a number of soils were made by the furnace combustion method, the Ag<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>-H<sub>2</sub>SO<sub>4</sub> method of Simon (*C. A.* 17, 2932) and the chromic acid combustion method. At the same time the Cl index according to Lapicque (*C. A.* 13, 884) was detd. The results of the furnace and Simon's methods checked very closely, indicating that the latter might well replace the more lengthy and complicated older procedure for such purposes. The chromic acid method yielded results lower to a greater or less degree because of its known failure to attack certain org. compds. and among them certain humic compds. The Cl index varied qualitatively with the humus content, giving an approx. measure of the latter.

P. R. DAWSON

**Ultimate analysis of the mineral constituents of a Hagerstown silty clay loam soil and occurrence in plants of some of the elements found.** WALTER THOMAS. *Soil Science* 15, 1-18 (1923).—The rarer elements V, Cr, Mo, Zr, Re, Cs, Li, Ba and Sr were isolated from a residual soil remote from metamorphic rocks. Although derived from limestone no CaCO<sub>3</sub> was found. The Ca and Mg were combined largely as amphibole and chlorite. K was combined largely as microcline and mixed acid feldspars. Orthoclase had practically disappeared. Some Fe<sup>2+</sup> was found. S existed largely in the free state or in organic combination. Only a trace of Cl was found. R. BRADFIELD

**The maintenance of organic matter in soils.** F. J. SIEVERS. *Science* 58, 78-9 (1923); cf. *C. A.* 17, 2026, 2161.—A discussion with emphasis upon the C-N ratio in soils.

P. R. DAWSON

**Manganese in the soil of Auvergne.** R. CHAVASTELON. *Compt. rend. agr. France* 9, 381-5 (1923).—The amts. of Mn present in the soil and subsoil were detd. by 2 methods, (1) ZnO and (2) HgNO<sub>3</sub>. Several types of soil were used. The amt. of Mn in fine soil varied from traces to 1.60 g. per 1000 parts of soil. The CaCO<sub>3</sub> of the same soils varied from traces to 254 g. The MgO varied from 0 to 18.4 g. and the Fe<sub>2</sub>O<sub>3</sub> from 12.6 to 90 g. per kg. of soil. The amt. of Fe and Mn appear to be correlated but the ratio Fe/Mn is not const. F. M. SCHERTZ

**The various effects of various types of vegetation on the degree of acidity of the soil.** C. RAUNKJAER. *Kgl. Danske Videnskab. Selskab. Biol. Medd.* 3, No. 10, 74 pp. (1922).—Forests make the soil more acid as compared with the original grass plains. This effect is probably due to the shadowing influence of the forest. Spruce, the darkest, gives a  $p_H$  value 2.02 lower than that of the corresponding grass plain, while beech and oak give  $p_H$  values about 1 lower than the grass plain. The av.  $p_H$  values for the soils of the various forests examined, were spruce 4.03, 4.01, 4.06; beech 5.26, 5.11, 5.29; old beech 4.68, 4.62, 4.93; oak, dark without underbrush open to wind, 4.87; oak dark with underbrush of beech and large beech trees surrounding the forest 5.26; oak open with underbrush 5.66; grass plains 6.05, 6.06, 5.91, 6.09, 6.05, 5.23 (7 years old on original spruce ground), 5.56 (7-10 years old on original beech ground) 6.07 (old plain on original beech ground). The degree of acidity had reached the original low value where the forest had been replaced by grass, which was allowed to grow for a longer period of time. The evapn. of the moisture from the surface layer of the soil in a dark forest where there is no vegetation is much greater than in a light forest with vegetation protecting the soil. The best conditions for a rich microflora and a rich animal life are a forest of medium shade and ground fairly well covered by plants with more or less broad leaves. These keep the moisture content of the soil at a suitable range.

HELGE SCHNSTRØD

**Soil acidity.** W. AUTON. *Tropical Agriculturist* 61, 34-6 (1923).—A discussion.

M. S. ANDERSON

**The danger of increasing soil acidity in light soils.** WALTER FISCHER. *Mitt. deut. Landw.-ges.* 38, 436-7 (1923).—Certain light, loamy sand soils on which rye and oats exhibited a yellow color and stunted, diseased condition were found to be distinctly acid, while adjacent soils on which the plants exhibited normal color and growth were practically neutral. These observations are in contradiction to those of Nolte (*C. A.* 17, 3222), who found that soils producing similarly diseased plants were of the same H-ion concn. as adjacent soils producing normal plants. The acid condition was attributed to heavy fertilization with KCl and  $(\text{NH}_4)_2\text{SO}_4$  and non-application of lime in previous years and to the wet season and consequent poor aeration of the soil. It was noticed that the acid soils were heavily infested with sorrel, heart's-ease, horse-tail and other weeds, while the neutral soils were practically free.

K. D. JACOB

**Phosphate behavior in soils.** J. S. BURD AND J. C. MARTIN. *Science* 58, 227-8 (1923).—By a procedure previously reported (*C. A.* 17, 3220) it was found that after a vol. of soln. equal to the amt. of  $\text{H}_2\text{O}$  initially contained in a compacted soil has been removed, the solns. obtained from a second displacement of the same mass of soil with an equal amt. of  $\text{H}_2\text{O}$  have decreasing total concns. of electrolytes but that the phosphate concns. increase. The importance of this fact is that at the approach of the end of the growing season the generally recognized diminished total concn. in the soil soln. may be, and probably is, accompanied by a tendency towards an enhanced concn. of phosphate. This effect if generally confirmed should explain many of the anomalies of P behavior in plant nutrition and obviate the necessity for assuming any special mechanism such as the excretion of plant acids to account for the relatively large P absorption as compared with low P concns. in the soil soln.

K. D. JACOB

**The efficiency of phosphates on red soils.** B. N. IYENGAR. *J. Mysore Agr. Exptl. Union (Bangalore)* 4, No. 3; *Biedermann's Zentr.* 52, 58-60 (1923).—Pot expts. were carried out with rye on a red soil rich in Fe and Al. Equiv. amts. of (A)  $\text{CaH}_4(\text{PO}_4)_2$ , (B)  $\text{Ca}_3(\text{PO}_4)_2$ , (C) superphosphate, (D) Thomas meal, and (E) bone meal were used with  $\text{NH}_4\text{NO}_3$ ,  $\text{NH}_4\text{NO}_2$  and stable manure,  $\text{K}_2\text{SO}_4$  and  $(\text{NH}_4)_2\text{SO}_4$  as basic fertilizers. With  $\text{NH}_4\text{NO}_3$  the total increase of grain and straw over the  $\text{P}_2\text{O}_5$ -free pots lay in the relative order of C, E, D, A, B, with  $\text{NH}_4\text{NO}_2$  and stable manure C, B, E, A, D; with  $\text{K}_2\text{SO}_4$  B, A, C, E, D; and with  $(\text{NH}_4)_2\text{SO}_4$  C, A, B, E, D. In all cases the greatest increases in grain were obtained with superphosphate. The plants absorbed the greatest amt. of  $\text{P}_2\text{O}_5$  from  $\text{CaH}_4(\text{PO}_4)_2$  and superphosphate, followed by  $\text{Ca}_3(\text{PO}_4)_2$ , Thomas meal and bone meal.

K. D. JACOB

**Carbon dioxide production and gas-permeability of soil.** H. LUNDEGÅRDH. *Kgl. Svenska Vetenskapsakad.* 18, No. 13, 1-36 (1923); *Intern. Rev. Sci. Practice Agr.* 1, 353-4 (1923).—L. describes special methods for the detn. of the  $\text{CO}_2$  production of free soils (soil respiration), and also the detn. of the abs.  $\text{CO}_2$  production at different depths. A simple mathematical relation exists between free soil respiration, the abs.  $\text{CO}_2$  production by the soil mass, the  $\text{CO}_2$  concn. of the air and the permeability of the soil by gases. In homogeneous soils the quotient soil respiration  $\div \text{CO}_2$  concn. of soil air gives the permeability. In heterogeneous soils the abs.  $\text{CO}_2$  production must also be considered.

In detg.  $\text{CO}_2$  formation and concn. at different depths in the soil the permeability of the different layers may be considered. Permeability is directly proportional to the diffusion coeff., by which it may be expressed. If  $a$  represents the abs.  $\text{CO}_2$  production, ( $b$ ) the difference between the amt. of  $\text{CO}_2$  present in the soil air and in the free air  $M$  the  $\text{CO}_2$  production at the surface, and  $P$  the permeability of the soil, the relation of these factors may be expressed by the following equations:  $ka = M$  and  $b = k(a/P)$  where  $k$  and  $k_1$  are consts. From these equations  $P = k_1(M/b)$  and  $P = k_1(a/b)$ .  $P$  is the inverse expression for the resistance to diffusion. Finally,  $P = k_1(M/b)$ . In detg. the total  $\text{CO}_2$  production and also the surface respiration which is found separately the  $\text{CO}_2$  fixed in the soil and that removed by water must be subtracted. The largest quantity, however, reaches the surface through diffusion. The production of  $\text{CO}_2$ , in proportion to soil wt., always diminishes with the depth of the strata.  $\text{CO}_2$  production can be accelerated by: (1) moisture, provided this does not decrease the soil permeability, (2) manure, which is very effective when dug in deep, (3) dil. solns. of certain salts, and (4) better aeration of the soil. The H ion concn. ( $p_H$  values from 3.7 to 7.5) and the presence of humic substances have no effect upon  $\text{CO}_2$  production. It is possible by means of suitable fertilizers to obtain a higher concn. of  $\text{CO}_2$  in the neighborhood of the assimilating leaves.

K. D. JACOB

**The ecological significance of soil shrinkage.** T. G. MASON. *West Indian Bull.* 19, 125-37 (1922).—Cacao grown in certain valleys of Dominica failed to thrive where the linear shrinkage of the soil on air drying exceeded 10%. An attempt was made to elucidate the significance of this relationship by comparing the percentage shrinkage of a no. of soils with their moisture residues at permanent wilting, and the percentage of moisture in the soil at the point of max. plasticity. It was concluded that the amt. of shrinkage exhibited by any soil on air drying is not detd. solely by its degree of dispersion but is dependent also on the degree of aggregation of the particles into compd. grains, the greater the dispersion and the less the aggregation, the greater the shrinkage for a given temp., rate of evapn., etc. The poor condition of cacao when rooted in soils whose linear shrinkage exceeded 10% was provisionally ascribed to the degree of diffusion of colloids in such soils, and not merely to their colloidal content. Diffusion of soil colloids renders the soil impermeable to  $\text{H}_2\text{O}$  and consequently poorly aerated, especially under conditions of prolonged and heavy rainfall. A bibliography of 23 references to the literature is included.

K. D. JACOB

**Effect of chemical agents on oxidation in soil-forming rocks and minerals.** G. J. BOUVOCOS. *Soil Science* 15, 19-22 (1923).—Rocks and rock minerals in wide variety were finely powdered in an iron mortar and 25 cc. of 0.1 N solns. of  $\text{Ca}(\text{NO}_3)_2$ ,  $\text{KNO}_3$ ,  $\text{KCl}$ ,  $\text{NaCl}$ ,  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NaOAc}$ ,  $\text{KOH}$ ,  $\text{NaOH}$ ,  $\text{Ca}(\text{OH})_2$  (0.01 N),  $\text{HCl}$ ,  $\text{HNO}_3$ ,  $\text{H}_2\text{SO}_4$ , citric and oxalic acids were added to 20 g. portions of the powdered rock. After a year in carefully stoppered tubes a wide variety of colors developed. The colors seemed due to the oxidation of the fragments of iron from the mortar.  $\text{Ca}(\text{NO}_3)_2$  and  $(\text{NH}_4)_2\text{SO}_4$  accelerated the oxidation in the presence of nearly every mineral while  $\text{Ca}(\text{H}_2\text{PO}_4)_2$ ,  $\text{KH}_2\text{PO}_4$ ,  $\text{CaCO}_3$  and  $\text{Ca}(\text{OH})_2$  prevented oxidation completely when used alone or in combination with other salts. The different effects of the salts are considered due to differences in their catalytic oxidizing power, although the effect on the hydrolysis and solv. of the Fe probably plays a role. The application of the results to color development in soils is pointed out.

R. BRADFIELD

**Oxygen-supplying power of the soil as indicated by color changes in alkaline pyrogallol solution.** L. M. HURCHINS AND B. E. LIVINGSTON. *J. Agr. Research* 25, 33-40 (1923).—A method is described for measuring the O-supplying power of the soil at different depths and under different conditions of soil moisture and of packing. The principle of the method is based on a comparison of the color changes produced in alk. pyrogallol soln. contained in a porous porcelain cylinder, the pores of which are filled with paraffin oil and through which the O diffuses from the surrounding soil. The results obtained in a preliminary study of the subject indicate, as was to be expected, that the O-supplying power of the soil for plant root becomes less (1) as the root lies deeper in the soil, (2) as the moisture content of the soil above the roots increases, and (3) as the soil above the root becomes more firmly packed. The O-supplying power of the soil about the roots of ordinary agricultural plants is estd. to be about 1% as great when the soil is packed and satd. by heavy rains as it is when the soil has recently been tilled and is not exceedingly moist.

W. H. ROSS

**Effect of reaction on growth, nodule formation and calcium content of alfalfa, alsike clover and red clover.** O. C. BRYAN. *Soil Science* 15, 23-35 (1923).—The plants were grown in quartz cultures with a modified Crone's nutrient soln\*. The reaction was kept fairly const. by the use of  $\text{Na}_2\text{HPO}_4$  and  $\text{Na}_2\text{CO}_3$  buffers and by renewing the solns.

daily. The crops grew for 4 months. Alfalfa and clover seeds germinate at a  $p_H$  too low for the growth of the seedlings. Young plants were more sensitive to acidity than older plants. Red clover made a feeble growth at  $p_H$  4. Alsike withstands an acid or an extremely alk. reaction better than alfalfa. Nodules form at any reaction at which the plants grow but are most numerous at or near neutrality. The crit.  $p_H$  values for all plants studied varied only slightly,  $p_H$  4 being the acid limit and  $p_H$  9-10 the alk. limit. The acidity found injurious to alfalfa was no greater than that found in some soils.

R. BRADFIELD

**Effect of acid soils on nodule-forming bacteria.** O. C. BRYAN. *Soil Science* 15, 37-40(1923).—Alfalfa, red clover and soy-bean bacteria lived and produced nodules 75 days after being placed in acid soils of different degrees of acidity provided the crit. acidity characteristic of each species was not exceeded. The crit. value was about  $p_H$  5 for alfalfa, 4.5-4.7 for red clover and 3.5-3.9 for soy beans. This value for soils is approx. the same as in pure cultures. The texture of the soil had no apparent influence.

R. BRADFIELD

**Acid phosphate production by the Lipman process. II. Building up sulfur floats** soil mixtures with a high content of total and soluble phosphate. J. S. JORFF. *Soil Science* 15, 41-8(1923); cf. C. A. 17, 2339.—When a large excess of  $Ca_3PO_4$  is present in S-floats-soil mixts. the amt. of  $H_2SO_4$  formed at any one time is small and there is no appreciable accumulation of acid. The amt. of  $P_2O_5$  rendered available is proportional to the concn. of acid. Too great a concn. of acid is, however, toxic to the S-oxidizing organisms. The optimum may be maintained by the gradual addn. of small amt. of insol. phosphates as the reaction proceeds. Composts contg. 15% total,  $P_2O_5$  and 7.5% sol.  $P_2O_5$  were prep'd. in this way after 24 weeks' incubation. **III. The use of greensand marl as the inert material in building up sulfur-floats mixtures.** *Ibid* 93-7.—Greensand marl supplemented with a little soil rich in org. matter may be used in place of soil as the inert material in the S-floats composts. It has the advantage of supplying some P and considerable K to the mixt. The previous papers are summarized. The Lipman process under proper conditions with mixts. having a total  $P_2O_5$  content of 16-18% will render 60-75% available in 3 months.

R. BRADFIELD

**The bacteriology of agricultural soil and its difficulties and fallacies.** GIACOMO ROSSI. *Intern. Rev. Sci. Practice Agr.* 1, 13-24(1923).—Difficulties encountered in expts. connected with bacteriological studies of agr. soils are pointed out and errors in theory and practice discussed. The frequent failure of expts. *in vitro* to give results that are indicative of actual bacteriological processes occurring in the soil is emphasized. It is hoped that a new impulse will be given the study of agricultural bacteriology through the standardization of methods of research in connection with fertile soils and the study of local schizomycete flora.

K. D. JACOB

**The physiological humidity of the soil and its direct determination.** T. G. MASON. *West Indian Bull.* 19, 137-54(1922).—The principle of the method adopted was similar to that of Livingston and Koketsu (C. A. 14, 3697); hard-leaded writing pencils were used in place of porous porcelain "soil points." A very nearly const. absorbing area was readily obtained by using an ordinary mech. pencil sharpener; the rest of the surface except the unsharpened end which was sealed with paraffin remained water-proofed by the varnish of the pencil. The pencil "soil points" are standardized, sharpened, weighed and inserted in the soil for a definite period, at the termination of which they are withdrawn and reweighed after careful removal of the adhering soil by a fine cloth. The gain in wt. is taken to be an index of the water-supplying power of the soil. It was found in using this method that by making 2 tests, 1 of 30 min. and the other of 3 hrs. duration, the water-supplying power of a soil could be detd. over a wide range of moisture contents. A high degree of correlation was found to exist between the colloid content of soils, as measured by the  $H_2O$  of imbibition at the point of max. plasticity, and the soil moisture residues at permanent wilting. A bibliography of 18 references to the literature is included.

K. D. JACOB

**Movement of soil moisture from small capillaries to the large capillaries of the soil upon freezing.** G. J. BOUVOCOS. *J. Agr. Research* 24, 427-31(1923).—Evidence is presented which shows that when a soil short of satn. is frozen, the force of crystn. tends to draw the moisture from the small capillaries and from around the particles as thick films into the larger capillaries. When the soil is wet or satd., under proper conditions the moisture freezes at the surface of the soil and forms capillary ice columns. The force of crystn. draws the water from below and it freezes at the lower end of the column and pushes the entire column upward. The relative distribution of the capillary water is between the finer and larger capillaries may have a very appreciable effect upon such factors as freezing-point depression, vapor-pressure lowering, osmotic pressure

and rate of evapn. Any treatment of the soil which will alter the relative distribution of the soil moisture as between the finer and the larger capillaries would seem to affect these factors.

W. H. Ross

**Pan formation in soils in the light of the Liesegang phenomenon.** N. G. CHATTERJEE. *Chem. News* 127, 84-6 (1923); cf. C. A. 16, 3782. —The formation of pans in soils is in all probability an example of periodic pptn. on a large scale. At first the sol. salts of Fe and Al are present in soln. throughout the mass of a medium of silicic acid gel formed from the sol resulting from the gradual disintegration of rocks by rain water and their colloidal dispersion. The alkali naturally present in the soil or the NH<sub>4</sub> formed from org. matter, reacting with the Fe and Al salts, produces the insol. hydroxides, which are pptd. in rings or narrow bands in the silicic acid medium. Drying of the silicic acid gel gives rise to the typical open-texture sandy soil, consisting of quartz grains, while the zones of Fe and Al hydroxide ppts. form the hard compact masses commonly called "pan."

P. R. DAWSON

**Soil treatments to overcome the injurious effects of toxic materials in eastern North Carolina swamp land.** M. E. SHEERWIN. *J. Elkska. Mitchell Nat. Soc.* 39, Nos. 1 and 2, 43-8 (1923). —The toxic material in the soil is sol. Fe. The application of kaolinite aids the crop and its K<sub>2</sub>O enables the plant to withstand large amounts of Fe. The Cl of kaolinite aids the passage of K<sub>2</sub>O into the plant. The Na combines with the nitrates produced by nitrification and reduces the amt. of Fe(NO<sub>3</sub>)<sub>3</sub> which may be formed. NaNO<sub>3</sub> aids K<sub>2</sub>O absorption and depresses nitrification so that an excess of Fe(NO<sub>3</sub>)<sub>3</sub> is not present. Acid phosphate retards the entrance of K<sub>2</sub>O and aids the accumulation of toxic Fe. Lime at the rate of 2 or 3 tons per acre gives good results, but over this amt. stimulates nitrification with the formation of excess Fe(NO<sub>3</sub>)<sub>3</sub>. HENRY W. EASTWOOD

**Microbiological analysis of soil as an index of soil fertility. IV. Ammonium accumulation.** S. A. WAKSMAN. *Soil Science* 15, 49-65 (1923); cf. C. A. 17, 1856, 2338. —No definite correlation was found between NH<sub>3</sub> formation in soln. and crop production, bacterial numbers or nitrification. Ammonification in sol cannot be used as an index of the soil fertility for: (1) all soils contain various groups of microorganisms which break down proteins to form NH<sub>3</sub>, (2) the final amt. of NH<sub>3</sub> accumulated is dependent on a number of factors, nature of protein, presence of carbohydrates, initial reaction, buffering ability of soil, rate of loss of NH<sub>3</sub> to the air. Ammonification can only be used to compare the activities of specific cultures of bacteria under controlled conditions and in studying the rate of decompn. of nitrogenous org. matter. R. BRAFIELD

**Biologic control of the influence of fertilizers; determination of the sensitive periods.** L. BLARINGHEM. *Compt. rend.* 177, 407-9 (1923). —A fertilizer test was made in 3 series of pots contg. uniformly poor soil to which was added the fertilizers N, K, P and Ca, singly, in pairs, in threes and one pot contained the 4 elements. Three control pots contained no added fertilizer. The series 1, 2, and 3 were planted with barley, flax and poppy, resp., the seeds of barley and of flax being of controlled lines. The effect of the fertilizers was estd. by biologic comparisons instead of the usual weighing of the crop. The effect of the fertilizers on barley was measured by the density of the heads and by the ratio of the length of the inter node next to the head to the entire length of the stalk. The effect on flax was measured by the length of stalk and density of foliage, and the effect on the poppy by the number of stigmas on a capsule and the number of capsules. By this method the action of fertilizers at particular stages of growth is shown. These actions are described for each fertilizer alone and for the various combinations of fertilizers. The max. precision of biologic control of fertilizer action is only obtained with pure lines of seed. L. W. RIGGS

**Contribution to the elucidation of recent fertilizer questions.** O. NOLTE. *Mitt. deut. Landw.-Ges.* 38, 449-53 (1923). —Germany is at present suffering from a deficiency of green and animal manures. The Rothamsted expts. covering a period of 70 years are cited to show that stable manure may be completely replaced by inorg. N without materially reducing the crop yield. Long experience has demonstrated that increasing the amts. of plant food gives results more nearly in accordance with the "ideal increase in yield curves" of Liebig and of Russell than with that of Mitscherlich. The opinion is expressed that there is in general little danger of injuriously acid soils resulting from the continued use of so-called physiologically acid fertilizer salts such as (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and KCl. K. D. JACOB

**Recent changes in artificial fertilizers.** ANON. *Agr. Gaz. N. S. Wales* 33, 629-30 (1922). —A brief discussion of the production of new air N fertilizers, the change in the chem. compn. of basic slag, and the replacement of K<sub>2</sub>SO<sub>4</sub> from the Stassfurt mines by KCl from Alsace. K. D. JACOB

**The economics of concentrated fertilizer.** W. H. ROSS AND A. R. MURZ. *Chem.*

*Met. Eng.* 29, 313-5(1923); cf. *C. A.* 17, 176.—A table giving the chem. and phys. properties of a no. of inorg. materials contg. one or more of the essential constituents of fertilizers is included.

P. R. D.

**Nitrogen fertilizer experiments of the German Agricultural Society in 1922.** GERMACH AND O. NOLTE. *Mitt. deut. Landw.-ges.* 38, 429-36(1923).—Expts. were carried out to det. the effect of increasing amts. of  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NaNO}_3$ , lime-N and  $\text{NH}_4$  sulfate-nitrate on the yield of winter rye, oats, sugar beets and potatoes grown on a wide variety of soils. In practically every case increasing the amt. of N fertilizer resulted in increased yields, but the increases in yield were not always proportional to the increase in amt. of fertilizer, and a point was reached where higher applications of N were not profitable. The extensive series of expts. is summarized in a table.

K. D. JACON

**Influence of potassium fertilizers upon the development and the chemical composition of different cultivated plants.** EMILE GODLEWSKI. *Compt. rend. agr. France* 9, 404-12(1923).—Plants grown on a soil poor in  $\text{K}_2\text{O}$  contain in their dry wt. less  $\text{K}_2\text{O}$  and more of the other nutritive elements than plants grown on a soil rich in  $\text{K}_2\text{O}$ . The amt. of assimilable  $\text{K}_2\text{O}$  in the soil is shown by analysis of the grain but is more striking in the straw. An abundance or lack of assimilable  $\text{K}_2\text{O}$  in the soil is more marked in the case of oats and beans than in other cereals and legumes. If  $\text{K}_2\text{O}$  is abundant in the soil, the  $\text{K}_2\text{O}$  content of the dry plants may be increased as much as 2%, while if the soil lacks  $\text{K}_2\text{O}$  the decrease in  $\text{K}_2\text{O}$  may amt. to 0.5%. In soil rich in assimilable  $\text{K}_2\text{O}$  the proportion of  $\text{K}_2\text{O}:\text{CaO}: \text{MgO}$  in dry plants is 100:23-28:7-9, while when  $\text{K}_2\text{O}$  is deficient the ratios are 100:55-120:16-17. Differences in the chem. compn. of the straw of various cereals is not large. The paper gives a summary of results obtained at Cracow.

F. M. SCHERZ

**Neutral phosphate, a contribution to recent endeavors in the phosphate fertilizer industry.** FRANZ KANTHAUSER. *Chem.-Ztg.* 47, 121-3(1923).—Heller's "neutral phosphate" is prep'd. by a process of digestion of mineral phosphate, bone meal, or mixts. of both, with small amts. of  $\text{H}_2\text{SO}_4$ , whereby the carbonates and fluorides are decompd. and  $\text{CaSO}_4$  is formed. The HF liberated tends to decompose the silicates while the  $\text{CO}_2$  evolved produces a state of fine subdivision and large surface, making the  $\text{P}_2\text{O}_5$  compd. more available. The product is neutral and contains 20-25% total  $\text{P}_2\text{O}_5$ , which shows a considerable solv. in citrate solns. and  $\text{CO}_2$ -satd.  $\text{H}_2\text{O}$ . Greenhouse and field expts. gave results equal to those from superphosphate.

P. R. DAWSON

**Nauru and Ocean Islands. Their phosphate deposits and workings.** H. B. POPP. *Agri. Gaz. N. S. Wales* 33, 391-402(1922).—The history of the discovery of the deposits is outlined. It is estd. that the deposits contain 100,000,000 tons of highest-grade phosphate (85-88%  $\text{Ca}_3(\text{PO}_4)_2$ ), sufficient to supply Australian needs at double the present rate of consumption for about 200 years. Evidence points to bird excreta as the source of the deposits but all org. and nitrogenous matter has been removed through submergence of the islands on several occasions. Methods of working the deposits are briefly described.

K. D. JACOB

**Acid phosphate: The basis of the present fertilizer industry.** W. H. WAGGAMAN AND H. W. EASTERWOOD. *Chem. Met. Eng.* 29, 528-32(1923); cf. *C. A.* 16, 3158.—A discussion of modern practice in the manuf. of acid phosphate. The imperfections of the process and the demand for high-grade phosphate rock under the present system of manufg. sol. phosphates resulting in immense loss of natural phosphates in the form of low-grade and finely divided ore are pointed out. "It would seem that the widest field for research and the greatest opportunity for advancing the fertilizer industry lies in improving existing methods and devising new and more efficient processes for manufg. available phosphates."

K. D. JACOB

**Leucite in agriculture.** G. DEANGELIS D' OSSAT. *Intern. Rev. Sci. Practice Agr.* 1, 305-16(1923).—The probable course of the decompn. of leucite in agr. soil may be represented as follows: Leucite, being a metasilicate of K and Al, the  $\text{K}_2\text{O}$  present may be regarded as a strong base and the  $\text{Al}_2\text{O}_3$  as a relatively weak acid, the whole forming a K salt of the hypothetical silicic-aluminic acid. When  $\text{H}_2\text{O}$  dissolves the compds. an electrolyte of a strong base like  $\text{K}_2\text{O}$  goes into soln. as does the silicic-aluminic acid, which, however, is not dissociated. The removal of the  $\text{K}_2\text{O}$  allows the  $\text{Al}_2\text{O}_3$  to act as a base and the complex acid breaks down giving rise ultimately to Al silicate and  $\text{SiO}_2$ . Leucite crystals remain fresh, vitreous and almost transparent beneath the surface of the soil, provided the soil is but little permeable to the atm., but in contact with the air they soon change with the production of different substances dependent upon the conditions. Complete analyses of samples of leucite from (I) the deposit of Latium pyroclastic material at Tor di Mezza Via (Albano), (II) the Alban Hills (Pratolongo), (III) Carbogna, Cimini (Casoria), and (IV) the lava of Borghetto, are given together with a

table showing the  $K_2O$  content of different Italian volcanic leucites. Magnetic and mech. methods of sepn. appear to offer the most economical means of concentrating leucite lavas and ores.

K. D. JACOB

**The effect of blood manures on citrus.** G. P. DARRELL-SMITH. *Agr. Gaz. N. S. Wales* 33, 823(1922).—Contrary to general opinion blood and bone fertilizers do not increase "die-back" and black spot of citrus and these materials plus  $FeSO_4$  rank next to farmyard manure in improving the trees.

K. D. JACOB

**The determination of potash in mixed fertilizers.** B. C. REES AND G. INGHAM. *J. S. African Chem. Inst.* 6, 49-52(1923).—Prior to pptg.  $K_3PtCl_6$  it is better to evap. the soln. of  $KCl$  and  $NaCl$  to dryness rather than to stop at syrupy consistency. Instead of using  $Ba(OH)_2$  to remove Ca and other cations, it is well to ppt. impure  $K_3PtCl_6$ , filter, wash and dissolve in hot water. The detn. of Pt by pptn. with  $HCO_3Na$  then gives good results for K.

W. T. H.

**Estimation of fineness of basic slag.** C. F. JURITZ. *J. S. African Chem. Inst.* 6, 71-5(1923).—Concurrent with changes during recent yrs. in the chem. character of com. basic slag, much of the material sold for fertilizers will not, as formerly, show 80% fineness when passed through a 100-mesh sieve. In studying the matter, it was found that several types of sieves were used in S. Africa but 30 out of 39 corresponded to the original Kahl guarantee. The point is raised, however, that specifications call for the no. of meshes per linear in. and pay little attention to the thickness of the wire. It is urged that more attention be paid to the size of the apertures and less to the no. per linear in.

W. T. H.

**Increasing yields by addition of carbon dioxide.** TH. MEINECKE. *Z. Forst. Jagdwesn* 53, 750-7; *Biedermann's Zentr.* 52, 78-9(1923).—The  $CO_2$  content of forest soils may be increased by (1) the bacterial action of stable and other manures, (2) application of  $CaCO_3$  and  $MgCO_3$ , (3) allowing dead underbrush to decay, and (4) raking up and burning piles of moss, weeds, briars, etc.

K. D. JACOB

**Effect of different concentrations of manganese sulfate on the growth of plants in acid and neutral soils and the necessity of manganese as a plant nutrient.** J. S. MCHARGUE. *J. Agr. Research* 24, 781-93(1923); cf. *C. A.* 16, 3109.—Applications of Mn in the form of the sulfate to an acid soil contg. 0.1% of Mn caused a decrease in the yields of crops, whereas like quantities of the same compd. when applied to different portions of the same soil, after addition of  $CaCO_3$  caused an increase in the yields of other plants of the same species. Mn apparently is essential for the normal growth and development of plants but a very small amt. is required. The etiolated condition of the young and tender leaves and buds of plants when Mn is lacking indicate that it has a function in the photosynthetic process and the formation of chlorophyll. Leguminous plants are thought to be more sensitive to the lack of Mn than are the non-legumes. The seeds of the plants tested contain enough Mn to maintain a normal development for the first 4 or 6 weeks but not enough for the growth of the plant to maturity.

W. H. ROSS

**The influence of cupric treatments on the productivity of wheat.** A. MORETTINI. *Sist. agrar. Ital.* 55, 265-77(1922).—The results of a comparison of the efficacy of fungicidal powders ("polvere Caffaro" and Cu carbonate) in the treatment of wheat smut with that of the usual treatment with a  $CuSO_4$  soln. is reported in a previous article (*C. A.* 17, 3563). The present study of the influence of the 2 methods of treatment on the productivity of wheat, independently of their anticryptogamic action against smut, shows that the dry treatment results in an increase of yield not only as compared with non-treated grain but also as compared with grain subjected to  $CuSO_4$  treatment; soaking of the grain before sowing, even with subsequent drying, does not injure the yield; Cu carbonate exercises a more favorable action than "polvere Caffaro" towards an increased yield; the increase of yield with both these powders seems to be principally due to their toxic action on the common molds and bacteria which attack the germinating caryopsides. This is not exerted on the wheat germ so that the grain attains a greater capacity for germination and a greater germinative energy. This favorable effect of the dry treatment presents another reason for its substitution for that with  $CuSO_4$  soln.

ALBERT R. MIERZ

**Fertilizing potatoes with increasing applications of ammonium sulfate on moor soils.** W. FELDT, R. HOPPMANN, W. WÖLK AND E. WEDELL. *Mitt. Ver. Förderung Moorkultur* 40, 224-7(1922); *Biedermann's Zentr.* 51, 252-3(1922).— $(NH_4)_2SO_4$  applied on moor soil at the rate of 0.8 dz. per ha. together with  $K_2O$  salts and Thomas meal increased the yield of potatoes by 5% of the check plot with no N. Applications of 1.6 and 3.1 dz. of  $(NH_4)_2SO_4$  per ha. decreased the yield 1 and 6%, resp. The decrease in yield with the larger amts. of  $(NH_4)_2SO_4$  was attributed to its physiologically acid re-

action on the easily influenced moor soil. The different amts. of  $(\text{NH}_4)_2\text{SO}_4$  had no effect upon the starch content of the potatoes. K. D. JACOB

**Diminution in the nitrogen content of manure under the influence of nitrifying bacteria.** B. NIKLEWSKI. *Bull. soc. chim. biol.* 5, 491-500(1923).—Important losses of N can take place, arising from the co-operation of nitrifying and denitrifying bacteria. A. T. CAMERON

**Plantation manures.** ANON. *Tropical Agriculturist* 60, 267-8(1923).—Partial analyses of coffee showed in the berry  $\text{P}_2\text{O}_5$  0.07,  $\text{K}_2\text{O}$  0.37, N 0.43%. The pulp showed  $\text{P}_2\text{O}_5$  0.13,  $\text{K}_2\text{O}$  0.37, N 0.18%. It is usually practical to return most of the pulp obtained from husks as fertilizer. M. S. ANDERSON

**Compost of grape marc.** L. Roos. *Prog. agr. vit.* 80, 301-3(1923).—A description of the fertilizer value of grape marc and the prepn. of a suitable compost therefrom. P. R. L.

**The tick bean as green manure.** F. B. GUTHRIE. *Agr. Gaz. N. S. Wales* 33, 751(1922).—The compn. of the whole tick bean plant in fertilizing elements is N 0.42,  $\text{P}_2\text{O}_5$  0.22, and  $\text{K}_2\text{O}$  0.54%. As a green manure it compares favorably with cowpeas, oats and rye. K. D. JACOB

**Fish meal and guano.** J. O'SULLIVAN. *Chem. News* 127, 98-100(1923).—Various methods of prepn. of fish meal are described together with the values and uses of the products. P. R. D.

**Urea, its commercial preparation and use as a fertilizer.** LUCIEN MAUGÉ. *Rev. prod. chim.* 26, 613-6(1923).—A review of the methods of prepn. and chem. and phys. properties of urea, with description of its manuf. by the cyanamide process and by the ammonium carbamate process (see Matignon and Fréjacques, *C. A.* 15, 671,1499; 16, 1395, 2628, 3872). Its production by mixt. of superphosphate and of  $\text{CaCN}_2$  gives a convenient and concd. fertilizer. Addn. of a certain amt. of  $\text{H}_2\text{O}$  to the mixt. and treatment with  $\text{SO}_2$  or with  $\text{CO}_2$  gives a max. transformation into  $\text{CO}(\text{NH}_2)_2$  and min. formation of  $\text{Ca}_3(\text{PO}_4)_2$ . A. PAPINEAU-COUTURE

**Fertilizer plants; fire record.** ANON. *Quart. Nat. Fire Protection Assoc.* 16, 294-5(1923).—Summary of the fire record of the N. F. P. A. of 200 fires in fertilizer plants classified as to causes, amt. of loss, and operation of automatic sprinklers where used. Seven especially interesting fires from spontaneous ignition of tankage, etc., are described in detail. C. L. JONES

**Two investigations in relation to sprays.** A. A. RAMSAY. *Agr. Gaz. N. S. Wales* 33, 513-4(1922).—Expts. indicated that there is no advantage in using  $\text{Na}_2\text{CO}_3$  in the prepn. of home-made tobacco infusions. Triple-purpose sprays prepnd. by mixing together Bordeaux mixt., tobacco ext., and Pb arsenate do not contain more than very slight traces of Cu in soln. after standing 2.5 days and the sol.  $\text{As}_2\text{O}_3$  is not more than 50% of the legal max. allowed for Pb arsenate and  $\text{H}_2\text{O}$  alone. K. D. JACOB

**Destruction of weeds by dehydrated iron sulfate.** ROEDERER. *Compt. rend. agr. France* 9, 517-9(1923).—A brief description of dehydrated iron sulfate and its use. F. M. SCHERTZ

**The preparation of colloidal sulfur.** A. A. RAMSAY. *Agr. Gaz. N. S. Wales* 33, 819-23(1922).—A no. of expts. are reported on the prepn. of colloidal S, for apple mildew control, from lime-S mixt. and  $\text{H}_2\text{SO}_4$ . The recommended procedure is as follows: Dil. 10 gal. lime-S mixt., 20° Bé., with 25 gal.  $\text{H}_2\text{O}$ . Add 15 pints of cold  $\text{H}_2\text{SO}_4$ , contg. 6 pints of strong com. acid, in small amts. with const. stirring until the original yellow color disappears and no further pptn. of S occurs. Allow the ptdt. S to settle. Decant the clear liquid and stir the ppt. with 10-20 gal.  $\text{H}_2\text{O}$  contg. 3 lbs. glue dissolved in just sufficient hot  $\text{H}_2\text{O}$ . This mixt. contains approx. 5 lbs. S and for use as a spray should be dild. to 250 gals. Analyses of ptdt. S prepnd. in this manner are given. K. D. J.

**A method of treating maize seed to destroy adherent spores of downy mildew.** Wm. H. WESTON, JR. *J. Agr. Research* 24, 853-60(1923).—Maize seed may be successfully treated to destroy adhering spores of downy mildew by covering the seed with concd.  $\text{H}_2\text{SO}_4$  after preliminary wetting with alc., allowing to remain 5-10 min. with stirring, draining and then washing for 1 hr. with running water. W. H. Ross

**Sulfuric acid and wheat rust.** E. RABATE. *Compt. rend. agr. France* 9, 403-4 (1923).— $\text{H}_2\text{SO}_4$  treatment caused the plants to become much greener and freer of fungi than those in the checks. The spray used consisted of 16-18 l. of 51-52° Bé.  $\text{H}_2\text{SO}_4$  per 100 l. of water. 1000 l. were used per hectar. The dil. acid fertilizes the land, destroys many of the objectionable weeds, reduces the lodging and the rusting of the grain. Treated plants were not so tall as untreated ones, and were somewhat retarded in growth.

F. M. SCHERTZ

**A metabolism disease in the fruit of the apple and its remedy.** L. LINNSBAUER.

*Z. Pflanzenkrankheiten und Gartenzucht* No. 1, 1 (1922); *Beidemann's Zentr.* **51**, 261-3 (1922).—A disease of apples occurring in South Tyrol is characterized by glistening chestnut-brown, sharply defined spots appearing on the calyx end of the fruit and causing a lateral checking of its growth. The trees bearing the affected apples had as a rule received no other fertilizer than manure during their early growth. Fertilizer expts. showed that the disease is caused by a deficiency of  $P_2O_5$ ; trees receiving applications of Thomas meal and superphosphate were free of diseased apples. The effect of fertilizers on the percentage compn. and transpiration loss of fruit grown on diseased trees is shown in the following table:

	Dry sub- stance	$H_2O$	N	P	K	Ca	Transpiration loss per 100 g. in 4 days
Sound apples	5.1	94.9	0.84	0.33	1.55	0.28	0.51
Diseased apples	10.9	89.1	0.63	0.33	1.56	0.33	0.98
Fertilized with K and Ca	....	91.0	0.71	0.46	1.59	0.43	0.93
Fertilized with P	....	94.7	0.82	....	1.77	0.33	0.67

No definite conclusions could be drawn concerning the effect of fertilizers on the chem. compn. of the leaves of diseased trees. K. D. JACOB

The action of copper sprays on mildew. JOSEPH CAPUS. *Compt. rend. agr. France* **9**, 543-8 (1923).—The theory is advanced that fungi such as *Plasmopara viticola* penetrate the tissues by chem. means and not mechanical. It is also assumed that the enzymes which aid in the penetration are killed by the copper sprays, for 0.000,00015 g. of copper in 100 cc. of soln. will prevent amylase from attacking starch grains.

F. M. SCHERZ

The white louse (*Oregma lanigera*; *Eriosema lanigerum*) and the value of colloidal sulfur as a remedy against it. J. KUVVET. *Arch. Suikerind.* **31**, 743 (8/1923).—The best remedy against this insect, which has in recent yrs. infested several plantations in Java, is wiping the leaves with mud or milk of lime. Kerosene emulsion has not given good results. Colloidal S, in a 2% soln., was successfully used in some places, but was found inefficient in most of them. It is too expensive and difficult to apply on the large scale. The 2% emulsion is not permanent unless about 0.5% of gum is added. Sometimes the S destroyed more beneficial parasites than lice, either directly or indirectly.

F. W. ZERBAN

Treating sewage sludge (Brit. pats. 196,239 and 196,637) 14. Plant for treating activated sludge (U. S. pat. 1,465,001) 14.

Fertilizers. PLAUSON'S (PARENT CO.), LTD. Brit. 195,655, June 28, 1922. Phosphate, feldspar and other raw materials are rendered colloidal for use as fertilizers by high-speed mech. disintegration in the presence of a large quantity of  $H_2O$  and a sol. silicate such as water glass. A small quantity of free alkali or substances, such as carbonates or sulfides, having an alk. reaction may also be present. The product may be concd. as described in 156,124 (cf. C. A. 15, 1788), or by means of the filter press described in 181,023. A disintegrator which employs very heavy pressure as described in 155,836 (C. A. 15, 1788) may be used. Org. colloids, such as sulfite cellulose liquors, tanning agents, proteins or gums, may be added with the water glass.

Fertilizers. SOC. D'ÉTUDES CHIMIQUES POUR L'INDUSTRIE. Brit. 197,690, May 11, 1923. A porous material, such as peat or turf, clay, pozzuolana, or other volcanic ash, is treated with a concd. soln. of cyanamide, obtained from  $CaCN_2$ , and the mixt. dried in air. When peat or turf is used the fertilizer contains urea. Previous to the drying the mixt. may be heated in the presence of  $N_2$ , air or  $CO_2$ , or of a mixt. of these gases, to a temp. preferably between  $60^{\circ}$  and  $90^{\circ}$  and not exceeding  $120^{\circ}$  and under a pressure of 5 to 25 atm. When peat is used the treatment may be repeated with a view to increasing the N content of the final product. The residues obtained by the treatment of  $CaCN_2$  with  $CO_2$ , described in 182,134 (C. A. 16, 4294), may be utilized as the porous material for this process.

Fertilizers. G. W. S. BREWER. Brit. 198,242, July 3, 1922. A dry or powd. fertilizer consists of peat or peat refuse, peat soil or other soil derived from land which has been under cultivation, "killed" lime or chalk, and one or more fertilizing agents such as phosphates, nitrates, potash salts, ammonium salts, soot, or fish manure. The peat, soil, and lime or chalk are mixed and allowed to stand for a few days with occasional turning; the mixt. is then dried, and, if necessary, disintegrated, and the fertilizing agents are added. The soil is stated to introduce nitrifying bacteria.

**Producing poisonous gases; fumigating.** J. W. VAN METER. Brit. 197,706, Dec. 12, 1921. A mixt. of poisonous gases is obtained by the action of Cl, preferably moist and under pressure, on a cyanide, with which a metal may be mixed to accelerate the reaction. The product comprises a mixt. or combination of Cl and cyanogen, together, it may be, with products resulting from the presence of the metal. As, Sb, Cu, Sn, Pb, and Fe are given as suitable metals, and when Fe is employed the resulting gaseous mixt. is stated to be suitable for orchard fumigation, the affected tree being enclosed in a gas-proof tent into which the gases are passed. By increasing the proportion of Cl, a gas mixt. adapted for the destruction of underground animals and insects is stated to be obtained. The gases may be generated in app. of the type described in 168,888; cf. C. A. 16, 784, 2824.

**Fumigants.** DEUTSCHE GESELLSCHAFT FÜR SCHÄDLINGSBEKÄMPFUNG. Brit. 196,524, July 21, 1922. In fumigating for the destruction of insects the gaseous or volatile poisonous substance employed is HCN or Et or Me cyanocarbonate, and to this is added a halogen acid ester, such as Me chlorocarbonate or a bromoacetate, a halo ketone, or a haloxylene, any of which is strongly irritating to the respiratory organs, so that escape of the vapors may be readily detected.

**Insecticide.** C. D. CASSADY. U. S. 1,468,342, Sept. 18. A mixt. adapted for destroying boll weevils or potato bugs is formed of carbolic acid 16, paraffin oil 28, NaOH 14, red oil 40, and oil of mirbane 30 oz.

**Insecticides.** C. W. DWYER. Brit. 195,886, May 15, 1922. A compn. for sealing worm holes in wood and destroying the worms, etc., consists of *p*-dichlorobenzene, non-mineral soap, and raw linseed oil.

**Colloidal insecticides, etc.** J. A. VIELLE. Brit. 196,012, Nov. 14, 1921. Naphthalene, camphor or a like org. solid of low m. p. is treated with H<sub>2</sub>O, in the presence of a protective colloid or a dispersator, in a colloid mill, such as that described in 155,836 (C. A. 15, 1788), rotated at high speed. The naphthalene, etc., is used in the proportion of more than 30 parts to less than 70 parts of H<sub>2</sub>O. Soap, fatty acid, glue, gelatin, sulfoxalicylic acid or its compds. and sulfonated castor oil are specified as suitable protective colloids or dispersators. Cf. 184,534.

**Magnesium arsenate for insecticide use.** E. O. BARSTOW and P. COTTRINGER. U. S. 1,468,983, Sept. 4. A reaction mixt. obtained from arsenic acid and Mg(OH)<sub>2</sub> or other Mg compd. which will react to form Mg arsenate is heated in an autoclave to a temp. above 100° to form a highly insol. cryst. product.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**The utilization of molasses.** XII. The manufacture of distilled and molasses vinegar. H. ARNSTEIN. *Louisiana Planter* 71, 71-2, 91-2 (1923); cf. C. A. 16, 4295.—A very thorough presentation of the quick vinegar process is made. Data on the air requirements and yields are given. The analyses required in the factory are described and methods of detg. alc., acidity and adulterants are given. C. H. CHRISTMAN

**The aldehydic phase in alcoholic fermentation.** G. PARIS. *Sitz. sper. agrar. Ital.* 55, 389-406 (1922).—When brewer's bottom yeast acts on sugar solns. to which Na<sub>2</sub>SO<sub>4</sub> has been added there is an increase in the aldehyde contained in the fermented liquid with increase of sulfite. No aldehyde is formed when NaHCO<sub>3</sub> is used instead of Na<sub>2</sub>SO<sub>4</sub>. Solns. of pyruvic acid, treated with yeast and Na<sub>2</sub>SO<sub>4</sub>, also form acetaldehyde. "The fact that yeast, whether acting on sugar or pyruvic acid, gives rise to acetaldehyde and CO<sub>2</sub>, while confirming that the acetaldehyde is an intermediate product of the fermentation, shows that the formation of the aldehyde is the result of a decarboxylation phenomenon and as such the substance from which it is derived should be the pyruvic acid." ALBERT R. MERZ

The utilization of the potato (GORE) 12.

**Molasses; yeast.** VEREINIGTE MAUTNER'SCHE PREßSAHNE FABRIKEN Ges. Brit. 196,926, April 26, 1923. Molasses to be used in making a culture medium for yeast are clarified by forming in them a voluminous ppt. produced by the action of NH<sub>3</sub> on Ca phosphate. Superphosphate is dissolved in the diluted molasses, H<sub>2</sub>SO<sub>4</sub> being added to aid soln. if alk. molasses, such as beet molasses, are employed, and the ppt. is produced with NH<sub>4</sub>OH.

**Yeast.** A. POLLAK. Brit. 197,935, May 14, 1923. A culture medium contg. proteins, such as ground legumes, soy meal, oil cake, cereal germs, bran grains, flesh meal, etc., is treated first with strong acids and then with weak acids, enzymes, etc., so as to produce the different amino acids and other decompn. products of protein required by the yeast. The material is first boiled with a strong acid, such as  $H_2SO_4$  or  $HCl$ , until the proteins are dissolved. The acids are then diluted, or partly neutralized, or wholly neutralized, or replaced by weaker acids or enzymes, etc.  $NH_3$  may be used for neutralizing the acid, or  $H_2SO_4$  may be neutralized with lime, or Ca phosphate or lactate, thereby replacing it by lactic acid or  $H_2PO_4^-$ .  $HCl$  may be neutralized with carbamide. Sol. albumins, enzymes, vitamins, org. P compds., etc., may be extd. before the operation and returned to the final product. After the acid has been neutralized, sugar may be added and lactic acid fermentation produced.

**Yeast.** A. POLLAK. Brit. 195,903, March 29, 1923. Yeast is subjected to treatment which increases the permeability of the cell membrane, in order to increase its power to assimilate N and to utilize the worts more thoroughly. The treatment is effected by the aid of enzymes which decompose semi-cellulose. Such enzymes are afforded by germinated cereals and leguminous seeds, the stomachs of ruminants, pancreatic secretions, "mortified yeasts," or the products of fermentation or autolysis of yeast, or of fungi of the genera *Aspergillus* and *Mucor*, and are contained in distillers' wash or spent liquid from the manuf. of yeast. The culture of yeast may be started in the ordinary way, and when reproduction slackens or stops, fresh seed yeast treated according to the invention may be added. It is stated that similar results can be obtained by increasing the acidity or alky. of the wort.

**Yeast preparations.** J. M. GUTHRIE and W. McEWAN & CO., LTD. Brit. 197,868, July 12, 1922. Yeast is "peptonized," e. g., by digesting with  $H_2O$  at 48-54° and the ext. debittered by means of colloid adsorbing agents, particularly high-power decolorizing carbons; wood charcoal and ordinary animal charcoal are not suitable. The "peptonized" ext. may be boiled, or, if it is desired to retain the enzymes, treated with air at about 50°. The C is then stirred in until the liquid is found to be free from bitterness, and the liquid filtered.

**Yeast extract.** CONTINENTALE INDUSTRIE-VERWERTUNG GES. Brit. 197,605, May 12, 1923. Yeast, from which bitter substances such as hirudin have been removed by treatment with alkali, is allowed to ferment in a soln. contg. sugar or starch, salts such as Ca phosphate or  $NH_4$  phosphate, and citric or tartaric acid. The mixt. is then neutralized with  $Na_2CO_3$  and boiled. Shiny substances are removed by treating with  $CaCO_3$ , boiling and filtering or centrifuging. The ext. is then concd.

**Utilizing waste products.** T. RIGBY. Brit. 195,911, Oct. 28, 1921. Sugar beet or grain is sliced or crushed, treated to obtain a sugar soln. or an ext. for brewing or distg. and the exhausted material is converted into a dry product suitable for cattle food or other purposes, the exhausted material being rendered semi-fluid by pulping to bring it into suitable condition for distribution as a thin uniform film on the heating surface of a film drier, and then dried in app. of the kind described in 149,055 or 180,963 (C. A. 17, 842) and 181,035, in which the vapor from the film being dried is used for heating another area of film-drying surface. The water content is reduced from about 70 to 10 or 15%, or to such amt. as will prevent harmful fermentation. The pulping process may be effected or completed in the drier itself, by introducing the material between two rotating drying drums having different peripheral speeds, as described in 178,636 and 180,963 (C. A. 17, 842). When a suitable agglutinant material is available the pulping may be wholly or partly dispensed with. Examples are given.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Plants producing chenopodium oil.** L. PYNAERT. *Bull. agr. Congo Belge* 14, 400-3 (1923).—A discussion of the culture of the chenopodium plant, the extn. of the oil and its properties. M. S. ANDERSON

**Packing of cinnamon leaf oil.** A. BRUCE. *Tropical Agriculturist* 61, 57 (1923).—The action of cinnamon leaf oil on various containers used in packing was tested. It is concluded that vessels of glass, Sn or Al should be used. Vessels of Fe, Cu or Pb should be avoided. M. S. ANDERSON

**Properties and uses of isopropanol.** H. C. FULLER. *Chem. Met. Eng.* 29, 538-9 (1923).—A review and discussion with new data. As a solvent and preservative, Mer-

$\text{CHOH}$  can replace  $\text{EtOH}$  in many cases and its use can be greatly extended to advantage. A series of standard pharmaceuticals showed no change in appearance or therapeutic value after long standing. Dentifrices, hair tonics, perfumes and toilet waters and essences of essential oils can be prep'd. with  $\text{Me}_2\text{CHOH}$ . As a dehydrating and constricting agent in histological work it is the equal of  $\text{EtOH}$ . Expts. on lower animals and human beings indicated that it has no injurious action on the optical system. Its internal action is comparable with the same amt. of  $\text{Me}_2\text{CO}$ , to which it is oxidized during metabolism. Comparative tests with  $\text{EtOH}$ , in which increasing amts. of the particular alc. were mixed with standard ext. broth and inoculated with *Bacillus typhosus*, showed the superiority of  $\text{Me}_2\text{CHOH}$  as a preservative agent and disinfectant. C. C. DAVIS

**Digitalinum verum.** A. WINDAUS AND G. BANDTE. *Ber.* 46B, 2001-7(1923).—The present paper constitutes the first step in a systematic investigation of plant heart-poisons and of phytosterols. It is proposed to clarify the chem. relationship existing between the several heart-poisons, and to this end establish the formulas of the individual "genines"; to prepare the unsatd. hydroxy- and oxo-lactones; to hydrogenize the latter and replace all excepting the lactone O by H; and finally to compare and test the resulting satd. lactones with respect to identity, isomerism and homology. Digitaligenin, one of the cleavage products of digitalinum verum, was first prep'd. via Kiliani (cf. *C. A.* 8, 3614) in a high state of purity, m. 211-2° and yielding values on analysis corresponding to the formula  $\text{C}_{24}\text{H}_{36}\text{O}_4$ ; acetyl-digitaligenin, needles, m. 208° (201-2° according to Kiliani). On hydrogenation, digitaligenin readily takes on the equiv. of 4 atoms of H, on further treatment 2 additional atoms. The first product resulting therefrom, *tetrahydrodigitaligenin*,  $\text{C}_{24}\text{H}_{38}\text{O}_4$ , long needles, m. 194°, obtainable by repeated crystn. of Kiliani's "hydrodigitaligenin," m. 184-6° from  $\text{EtOAc}$ ; *acetyltetrahydrodigitaligenin*, needles, m. 167-8°, probably identical with the Ac deriv., m. 165°, prep'd. by Kiliani. *Hexahydrodigitaligenin*,  $\text{C}_{24}\text{H}_{40}\text{O}_4$ , iridescent crystals, m. 186-7°, from either digitaligenin or its Ac deriv.; yields on oxidation with  $\text{CrO}_3$  in  $\text{AcOH}$  *hexahydrodigitaligenone*,  $\text{C}_{24}\text{H}_{38}\text{O}_5$ , fine needles, m. 205-7° (obtainable also by repeated crystn. of Kiliani's ketone, m. 190-2°); *oxime*,  $\text{C}_{24}\text{H}_{38}\text{O}_5\text{N}$ , needles, m. 205-6° (mixt. of ketone and oxime, m. 175-80°); *lactone*,  $\text{C}_{24}\text{H}_{36}\text{O}_2$ , by reduction of ketone with  $\text{ZnIg}$  and  $\text{HCl}$  in  $\text{AcOH}$ , needle clusters, m. 168-9°. W. O. E.

**Possibilities of camphor cultivation from *Cinnamomum camphora* in northern India.** S. H. HOWARD, W. A. ROBERTSON AND J. L. SIMONSEN. *Indian Forest Records* 9, Pt. 7, 307-40(1923).—Camphor may be easily cultivated in all parts of India with a rainfall of 40° and over, but as a com. enterprise its cultivation should not be attempted outside the tropical areas, and even here the financial returns are likely to be small. In connection with camphor cultivation much exptl. work still remains to be done. Suggestions are made. W. O. E.

**Constituents of some Indian essential oils. IX. Leaf oil from *Pinus excelsa*.** X. Essential oil from the oleo-resin of *Pinus gerardiana*, Wall. J. L. SIMONSEN. *Indian Forest Records* 9, Part 8, 341-8(1923), cf. *C. A.* 17, 3402.—IX.—A detailed examn. of the oil shows it to consist mainly of *l*- $\alpha$ -pinene and *l*- $\beta$ -pinene (about 84%), while from the higher boiling fractions *l*-limonene, *l*-terpineol, borneol, a sesquiterpene and a sesquiterpene alc. were obtained. The combined acids in the oil were  $\text{AcOH}$ , butyric or isobutyric, caprylic and lauric (?) acids. These results indicate that the oil would possess little if any com. value except possibly as a source of synthetic camphor, terpineol or allied products. It is interesting to note that all the Indian "leaf oils" so far examd. have a very low ester content, thus differing markedly from the "leaf oils" obtained elsewhere. X.—An examn. of the oil shows it to consist almost entirely (about 80%) of *d*- $\alpha$ -pinene and *d*- $\beta$ -pinene, the former being present to the extent of approx. 73%. In addn. a sesquiterpene was isolated in a pure state, but since it did not yield any solid derivs. it could not be characterized. A small amt. of a sesquiterpene alc. was also sep'd. but not obtained pure. W. O. E.

**Lavender, its cultivation for marketing and distilling.** A. H. HOARE. *J. Ministry Agr.* 30, 543-7(1923).—The subject matter is arranged under the headings: soil and situation, prep'n. and cultivation of the land, plants and planting, marketing the crop, distg., lavender disease and pests. An illustration of a large scale plant is shown. W. O. E.

**Thrysus blood and Thrysus oil.** LUDWIG WINKLER. *Pharm. Monatshefte* 4, 105-6(1923).—Certain fossil formations occurring in the Tyrolian Alps near Seefeld have for mythological reasons acquired the name Thrysus blood, while the oily product, Thrysus oil, obtained therefrom found medicinal application. The greater portion of the Seefeld mineral oil obtained to-day is subjected to chem. treatment in various ways, appearing on the market under different names as a therapeutic agent. W. O. E.

**Modern technical methods for the manufacture of synthetic perfumes. IV. Phenylethyl alcohol.** ARTHUR LEWINSON. *Perfumery Essent. Oil Record* **14**, 336-7 (1923); cf. *C. A.* **17**, 2031, 2984.—While simple in theory, the prepn. of this alc. presents considerable difficulties in practice. Starting with  $\text{PhCH}_2\text{CN}$ , L. describes in detail the various operations involved in passing successively to  $\text{PhCH}_2\text{CO}_2\text{H}$ ,  $\text{PhCH}_2\text{CO}_2\text{Et}$  and  $\text{PhCH}_2\text{CH}_2\text{OH}$ , the latter being obtained in a yield of 65% of the ester employed.

W. O. E.

**Santoperonin, a new vermitifuge.** A. E. PLANT. *Pharm. Monatshefte* **4**, 128-30 (1923).—Cf. Marx, *C. A.* **16**, 2960; **17**, 612, 1300, 1529.

W. O. E.

**Fluidextracts from domestic medicinal plants.** LUDWIG KROEMER. *Pharm. Zentralhalle* **64**, 291-7, 343-4, 353-6 (1923); cf. *C. A.* **16**, 4207. Results are reported from a study of a series of fluidexts. ( $\text{EtOH}$  3,  $\text{H}_2\text{O}$  7) obtained in operations with certain "siliceic acid drugs." Thus, the ext. *Equisetis arvensis* had  $d_{10}^{\circ}$  1.085, dry residue 21.40, ash 6.27% ( $\text{SiO}_2$  5.50%); *Polygonum aviculare*,  $d_{10}^{\circ}$  0.992, dry residue 7.85, ash 1.08% ( $\text{SiO}_2$  1.008%); *Galeopsis ochroleuca*,  $d_{10}^{\circ}$  1.036, dry residue 17.18, ash 1.96% ( $\text{SiO}_2$  0.328%). Comparisons are drawn between K.'s prepns. and those of other investigators.

W. O. E.

**Dr. Adolph W. Miller.** G. M. BERINGER. *Am. J. Pharm.* **95**, 686-91 (1923).—An obituary with portrait.

W. G. GARSSLER

**Terpeneless oil of ylang-ylang.** ANON. *Parfumerie moderne*, March 1923; *Industrie chimique* **10**, 414 (1923).—Natural oil of ylang-ylang has a d. of 0.911-0.905 and  $[\alpha] -4^\circ$  to  $-49^\circ$ . Terpeneless oil has a d. 0.934,  $[\alpha] +50^\circ$ , and is easily sol. in 80% alc.

A. PAPINEAU COUTURE

**Oil of bergamot.** DE SAINT-RAT. *Parfumerie moderne* 1923, 133 (June); *Industrie chimique* **10**, 412 (1923).—The quality of oil of bergamot depends on the nature of the soil, the climate, and the degree of maturity of the fruit. The *linalyl acetate content* increases with the dryness of the season and with the quantity of fruit on the trees, but apparently bears no relation to the quality and varies within wide limits in pure oils.

A. PAPINEAU COUTURE

**Extract of masticogua (*Atractylis gummifera*) in commercial licorice products.** P. BERTOLO. *Giorn. chim. ind. applicata* **5**, 391-2 (1923).—The method of Giuffrè (*Giorn. chim. ind. applicata*, Oct. 1922; cf. *C. A.* **17**, 179) for detg. masticogua adulteration in licorice products is not well adapted to examin. of com. products, as it requires long and delicate operations for the extn. and purification of the active principle (atractylane) and of its final cleavage products. B.'s method depends upon the extn. of the active principle contained in masticogua by means of abs. alc., and in the recognition of the sulfonic group present in the glucoside mol., and is as follows: Break up the licorice ext. into small pieces and dry in an oven at  $100^\circ$ . Place in a flask with reflux together with abs. alc., and heat over a bath for about  $1/4$  hr. Filter the liquid through a dry filter, distil off the greater part of the alc., evap. in a porcelain dish, add an excess of  $\text{NaNO}_2\text{-Na}_2\text{CO}_3$  mixt. free of sulfates, heat slowly with direct flame and calcine until the mass is all white. Cool, take up with  $\text{H}_2\text{O}$ , acidify with pure  $\text{HNO}_3$  and test the clear liquid with  $\text{BaCl}_2$ . A ppt. of  $\text{BaSO}_4$  confirms the presence of the sulfonic group of the glucoside mol. Unadulterated licorice always gives negative tests while adulterations of licorice with masticogua invariably give positive reactions, down to 5% adulteration. For quant. detns. B. established that ext. of masticogua contains about 2% glucoside (referred to the moist ext.), that the glucoside contains 7.60% S, and that 1 g.  $\text{BaSO}_4$  corresponds to 1.807 g. glucoside. In quant. detns. the extn. with abs. alc. should be repeated 3 times for complete extn. and the liquids combined.

R. S. P.

**Official procedures in sterilizing.** P. E. LUNDIN. *Svensk. Farm. Tids.* **27**, 401-7 (1923).—This paper, like that of Huss (*C. A.* **17**, 3072), takes up the subject of prepn. of sterile pharmaceutical preps. in the coming *Pharm. Suec.* The 2 papers summarize the official methods of the pharmacopeias of all the nations.

A. R. ROSE

**Deterioration of digitalis.** HUGO WASTENSON. *Svensk. Farm. Tids.* **27**, 433-5 (1923).—Figures are given showing that digitalis deteriorates rapidly if not properly stored. W. concludes that storage of digitalis should be subject to legislative act and the state should undertake to test the digitalis in the market. The moisture should not be allowed to exceed 1.5%. For small storage it should be in lots of 50-100 g. and kept in dark glass bottles and stoppered with paraffined corks. When stored in quantity it should be either in glass or in soldered tins.

A. R. ROSE

**An improved method for the determination of nicotine in tobacco and tobacco extracts.** O. M. SHEDD. *J. Agr. Research* **24**, 961-70 (1923).—A method has been devised for the detn. of nicotine in which an ether extn. of the nicotine is substituted for the steam distn. common to both the official silicotungstic acid and Kissling methods.

The nicotine is then extd. from the ether with acid and the detn. completed as in the former method. The improved method has been found to be as rapid and as accurate as the silicotungstic acid method in the analysis of tobacco and tobacco exts. and more satisfactory on tobacco. A direct pptn. method which obviates a preliminary ether extn. or steam distn. to obtain the nicotine has also been tried and fairly satisfactory results were obtained on most of the tobacco exts. employed. It was not found, however, to be applicable to tobacco and a few exts.

W. H. Ross

**Recent adulterations of certain drugs.** F. RICHARD AND M. MALMY. *J. pharm. chim.* **28**, 118-22(1923).—Com. saffron is admixed with 10, 25 and 50% and more of "yellow flowers" ("of Saloniki"), which are the stamens of *Crocus sativus* and *C. vernus*; the purest saffron (Gâtinais) contains less than 1% thereof. Com. ipecac is poorly cleansed and is said to contain 15.8 to 30% extraneous matter; 5% might be allowed. In the place of couch grass (*Agroprymum repens*), an unofficial drug, "Italian dog-tooth" from *Cynodon dactylon* is met with. It contains starch, which is absent in the official drug. A recent lot of pine buds consisted mostly of too far expanded ends of twigs, concealed in the inside of the bale.

S. WALDBOTT

**Medicated gauzes and cottons devoid of medicaments.** F. RICHARD. *J. pharm. chim.* **28**, 145-8(1923).—"Phenolated" cotton and gauze were repeatedly found devoid of any PhOH content. In gauzes of  $ZnO_2$ , no peroxide was present, possibly lost through chem. action of the org. matter; these gauzes should be prep'd. as needed, but in several cases not even Zn was present. When gauze, cotton or wood wadding are treated with  $HgCl_2$ , the latter in time is reduced to insol.  $HgCl$  (cf. Barral, *C. A.* **17**, 3568); hence the Codex should discard this prep'n.

S. WALDBOTT

**An iodometric method for the determination of lead; applied to the assay of (Gouillard's) extract of lead.** L. CUNY. *J. pharm. chim.* **28**, 154-8(1923).—Ppt. the Pb soln. with a definite excess of standard  $KIO_4$  soln.; the pptd.  $Pb(IIO_4)_2$  is little sol. in  $H_2O$  (0.03 g. in 1 l. at 25°). Fill up to a definite vol., filter and det. the excess of  $KIO_4$  in an aliquot part; add a 10% soln. of KI and dil.  $H_2SO_4$  (1:3); then after 15 min. titrate with  $Na_2S_2O_3$  soln. Results on 11 samples agree well with those of gravimetric detns. by means of  $PbCrO_4$ .

S. WALDBOTT

**Monographs on pharmaceutical preparations. I. Tincture of iodine.** MARIE SHAW AND V. COFFMAN. *Pharm. J.* **110**, 452-5(1923).—An historical review and pharmacopeial record of tincture of I with a critical review of the literature on its instability.

S. WALDBOTT

(**Effect of hydrogen-ion concentration in prescriptions.**) W. L. SCOVILLE. *Bull. pharm.* (Oct. 1922); *Pharm. J.* **110**, 466-7(1923).—A mixt., of U. S. P. soln. of K citrate (120 cc.) contg. urotropine (7 g.) and  $KAcO$  (7 g.), with peppermint- $H_2O$  (4) (60 cc.) contg. caffeine citrate (7 g.), was clear, but soon ptd. a mass of crystals, although the total vol. of  $H_2O$  was sufficient to hold the salts in soln. The buffer action of K citrate and  $KAcO$  diminishes the H-ion concn. of citric acid and thus prevents soln. of caffeine, as well as the (undesirable) interaction between citric acid and urotropine. To effect a clear soln. and preserve its therapeutic value, doubling of the final vol. by adding 180 cc. of *A* and prescribing the double dose is suggested.

S. WALDBOTT

**Loss of morphine in powdered opium by keeping.** A. C. ABRAHAM AND J. RAE. *Pharm. J.* **111**, 28-30(1923); cf. *C. A.* **16**, 4299.—Loss as well as gain of morphine in opium on keeping have been observed (*C. A.* **16**, 4300). A. and R. think it possible that opium contains both oxidizing and reducing agents; in presence of much air, oxidation may reduce the morphine content; then, if fresh air is excluded, reduction may counteract the effect and may even restore morphine. To guard against changes, the bottles contg. powdered opium should be well-stoppered and, possibly kept filled.

S. WALDBOTT

**The British Pharmaceutical Codex, 1923.** W. L. BROWN. *Pharm. J.* **111**, 59-60 (1923).—A critical review of its contents.

S. WALDBOTT

**Bismuth and sodium bismuth tartrates.** C. E. CORFIELD AND F. W. ADAMS. *Pharm. J.* **111**, 82-5, 123-4; *Chemist & Druggist* **99**, 134-6(1923).—Bi tartrates prep'd. by pptn. are not well defined compds.; they are mixts. of oxytartrates (*A*). By digesting *A* with tartaric acid, a cryst. substance is obtained of the compn.  $Bi_2(C_6H_4O_6)_3 \cdot 2H_2C_6H_4O_6$ . *A* also dissolves readily in alkali, forming alkali Bi tartrates (cf. *C. A.* **16**, 1832). For therapeutic purposes, distinction should be made between the "acid" and the "neutral" substances. However, the compn. of the different com. prepns. of either class is not uniform, and the substances prep'd. and examd. by C. and A. are mixts. of more or less complex Bi compds. C. and A. were unable to prep. a compd. analogous to tartar emetic. For injection in protozoal diseases (*C. A.* **15**, 3145), in aq. soln. or oil suspension, the use of a *neutral*, sol., white powder, prep'd. by pptg. with strong EtOH

a soln. (*B*) of freshly pptd. *A* in NaOH (cf. C. R. Cowley, *C. A.*, **5**, 1492; **7**, 2882) is suggested. When an acid substance is required for oral administration in digestive complaints, prepns. obtained by adding  $H_2C_6H_5O$  or  $NaHC_6H_5O$  to soln. *B* and evapg. is recommended, as it is of uniform acidity and Bi content. S. WALDHOFF

**Examination of the bark of Erythrophleum Guineense.** C. W. MAPLETHORPE. *Pharm. J.* **111**, 85-7, 125; *Chemist & Druggist* **99**, 137, 9 (1923); cf. *C. A.*, **6**, 2817. Bark obtained from the Armani Inst., East Africa, yielded by the Keller process, about 0.1% of alkaloid. Neither this, nor the picrate, thiocyanate, or HCl salt could be obtained in crystd. form. S. WALDHOFF

**Investigation of colchicum and its galenicals.** J. GRIER. *Pharm. J.* **111**, 87-9, 125-6; *Chemist & Druggist* **99**, 140-2 (1923). The method of E. C. Davies (*C. A.*, **15**, 3804; **17**, 1863) for the detn. of colchicine (*C*) gives excellent results, and is applied to the quant. detn. of *C* in the corms, the seeds and the galenical prepns. of these drugs. The previous results of D., 0.38-0.4% *C* in the corms, and 0.72-0.75% in the seeds, compare well with accepted standards. In the prepns. of the *tincture*, 45% EtOH fully exhausts the drug of its *C*, but also dissolves proteins which in the assay must first be pptd. with EtOH. Still, the "buffer" action of these proteins retards hydrolysis, rendering the *tincture* as stable as that with 70% EtOH, used in B. P. 1913, and which is thinner and purer. *Wine of colchicum* contains *C* in the stable form of tannate which is sol. in weak EtOH; hence detannated wine should not be used in its prepns. In 7 samples, 3 to 20 yrs. old, 6 had retained a high % of *C*. In the form of *ext.*, *C* is also fairly stable. A sample of *acetum colchici* 40 yrs. old seemingly retained its full strength. A com. sample of U. S. P. *fluidextract* gave 0.326% *C*; required, 0.4%. In order to retain *C* unchanged in its galenical prepns., acids as well as alkalies should be avoided; heat is harmful only in presence of alkalies and acids except AcOH. S. WALDHOFF

**Activity of pharmacopeial preparations of ergot.** A. J. CLARK AND W. A. BROOM. *Pharm. J.* **111**, 89-91, 126-7; *Chemist & Druggist* **99**, 142-4 (1923). "(1) The methods of standardizing ergot prepns. upon the isolated interna or upon the ext. interna, *in situ*, measure chiefly the amine content of the ergot prepns. (2) The action of ergot prepns. in reversing the action of adrenaline upon the isolated rabbit interna can be made the basis of a convenient method of standardizing ergot prepns. The method measures only the content in ergot alkaloids and very small quantities of these can be detected. The results agreed with those obtained by the cock's comb method and the cat blood pressure method. (3) The instructions of the Brit. Pharm. if followed exactly, result in prepns. almost completely devoid of ergot alkaloids, although from the same samples of ergot the U. S. P. method exts. considerable quantities of ergot alkaloids. The B. P. method can, however, be modified (by allowing to ferment) so that a certain proportion of these are obtained. (4) Since the ergot alkaloids are the only known active principles of ergot that are specific to it, the methods of prepns. laid down in the B. P. appear to be frankly absurd." S. WALDHOFF

**Further examination of Artemisia brevifolia.** H. G. GREENISH AND C. W. MAPLETHORPE. *Pharm. J.* **111**, 94-5, 127-8; *Chemist & Druggist* **99**, 147-8 (1923); cf. *C. A.*, **15**, 924.—In a new lot received from India, the yield of santonin was only about 50% of the former. The leaves are the only parts of the plant so far examed. that are of value as to santonin extn. The ash content of leaves, stems, root and flowering top was, resp., 10.55, 4.73, 4.40, 5.39%. S. WALDHOFF

**Note on East African cinchona barks.** H. G. GREENISH AND C. E. CORRINGTON. *Pharm. J.* **111**, 95-6, 128-9; *Chemist & Druggist* **99**, 149-50 (1923). The barks of 3 cinchona trees, hybrids of *C. succirubra* and *C. Ledebouriana* cultivated in Ger. E. Africa, proved of good quality as to yield of quinine; this was, resp., 6.97, 5.45, 6.77%; cinchonidine 0.62, 2.7, 0.73%; quinidine none; yield of crystd. quinine sulfate 9.48, 7.41, 9.20%. The high quinine content and the small amt. of other alkaloids present would amply justify the extension of the cultivation of these hybrids. S. WALDHOFF

**Note on tintura cardamomi composita, B. P. 1914.** J. H. FRANKLIN AND J. GREENHALGH. *Pharm. J.* **111**, 96-7, 129-30; *Chemist & Druggist* **99**, 149-50 (1923).—The official prepns. forms a bulky, gelatinous ppt., owing to 2 causes: interaction between the tintures of cochineal and of caraway, intensified by the pptn. of oil in cold weather. A formula is given producing a tinture identical in character to that of the Brit. Pharm. and free from the tendency to ppt., even when kept at 0° for 2 months. A 45% EtOH is used in extn., the mare not being pressed; the tinture is then finished with 90% EtOH, and is of about 45% final strength. The use of a 60% EtOH in extn. (Hill and Umney, 1915), also avoids the trouble, but is more expensive. S. WALDHOFF

**Lithium, sodium, potassium and ammonium hippurates.** C. E. CORRINGTON AND B. W. MELHUISH. *Pharm. J.* **111**, 97-8, 130; *Chemist & Druggist* **99**, 150-2 (1923).—

The *Li salt*, easily cryst., has the compn.  $BzNHCH_2COOLi \cdot 2H_2O$ . The *Na salt* is crystd. from EtOH with 1.5  $H_2O$ ; 1  $H_2O$  is left after drying over  $H_2SO_4$ . The salt with 0.5  $H_2O$  of the B. P. Codex 1911 was not obtainable. The normal *K salt*, +  $H_2O$ , of Schwarz (1845), is cryst. but deliquescent; the acid salt could not be prep'd. The "acid"  $NH_4$  hippurate (Schwarz) was a mixt. of normal salt with free acid. Its compn. varies with the degree of evapn. The prep'n. of a crystd. neutral  $NH_4$  salt by L. McMaster's method (1904; satn. of a concd. 95% EtOH soln. of the acid with  $NH_4$ ), is confirmed, except that at least 2 vols. of EtOH must be added to the alc. soln. to induce pptn. The  $NH_4$  salt may be prep'd. more economically by evapg. a soln. of the acid in strong  $NH_4OH$ , keeping the soln. satd. with  $NH_3$  during evapn. This salt, also that prep'd. from EtOH soln., is normal, without  $H_2O$  of crystn. All attempts to prep. acid hippurates by evapg. the *N* salts with mol. amts. of the acid have failed. S. WALDBOTT

**Note on digitalis leaves.** E. M. HOLMES. *Pharm. J.* 111, 266-7 (1923).—H. gives reasons for the difference paid for collecting and drying, and the cost of the final prep'n. They are, in part, the high % of  $H_2O$  (72-80), reabsorption of  $H_2O$  by the dried leaf, and its gradual deterioration, and various economic reasons. The Brit. Pharm. should direct collecting the leaves in September (when they are in most uniform condition), and after drying they should be kept in bottles "chemically dry." S. W.

**Action of potassium carbonate on glass.** J. F. LIVERSEGBE. *Pharm. J.* 111, 277 (1923).—Samples of  $K_2CO_3$  contg. 17.1-18.2%  $H_2O$  were mixed with powd. glass contg. Pb and As and kept in white glass bottles for 3 months. The amt. of sol. Pb removed was 1400 p. p. m. of As, 70-100 p. p. m. A similar sample of  $K_2CO_3$  simply put into a glass bottle for 3 months absorbed 18 p. p. m. of Pb, in another expt. 7 p. p. m. S. WALDBOTT

**The British Pharmaceutical Codex, 1923.** W. R. GROVE. *Pharm. J.* 111, 307 (1923).—A review of its up-to-date and practical medicinal features. The work of T. Bird (C. A. 15, 924) is cited against the statement that "free I is not given much internally, owing to its tendency to irritate the stomach." S. WALDBOTT

**Some salient aspects of the British Pharmaceutical Codex, 1923.** J. F. TOCHER. *Pharm. J.* 111, 308-9 (1923).—A review of its contents and usefulness. S. W.

**Some interesting medicinal plants of Bolivia.** H. H. RUSBY. *J. Am. Pharm. Assoc.* 11, 775-8 (1922).—History of *coto* and *cocillana*. L. E. WARREN

**Histology of cocillana and substitute barks.** C. W. BALLARD. *J. Am. Pharm. Assoc.* 11, 781-7 (1922).—Cocillana (*Guarea Rusbyi*) has been adulterated with various barks. Genuine cocillana and three adulterants *C. bangii*, an unidentified species of *Guarea* and a species of *Neckandra*, were studied. Histological characters of the several barks are described and illustrated with drawings. L. E. WARREN

**The action of light on soluble ferric phosphate.** N. R. MUELLER. *J. Am. Pharm. Assoc.* 11, 787-92 (1922).—The elixirs contg. sol.  $FePO_4$  are unstable in light. M. has studied varying solns. of  $FePO_4$  under different conditions of storage. A part at least of the instability is due to the action of light on citric acid in the presence of  $Fe^{III}$ .  $CO_2$  is produced in considerable quantity. The presence of  $Na_2HPO_4$  retards the decompr. The decompr. does not occur with  $Fe^{II}$  in place of  $Fe^{III}$ . L. E. WARREN

**Improving the keeping qualities of chalk mixture.** B. FANTUS AND C. M. SNOW. *J. Am. Pharm. Assoc.* 11, 793-6 (1922).—The chalk mixt. now official is objectionable because of its sucrose content, the latter being fermentable and not suitable for administration in certain diarrheas. If saccharin be substituted for sucrose the mixt. decomposes in light. Some other less reactive oil than cinnamon must be used if saccharin is to be employed. A satisfactory formula was not found. L. E. WARREN

**Some incompatibilities of aspirin.** E. A. RUDDIMAN. *J. Am. Pharm. Assoc.* 11, 796-8 (1922).—Acetylsalicylic acid was triturated with an equal wt. of various substances and the mixts. allowed to stand. The odor of  $C_6H_5O_2$  was watched for and a freshly prep'd. soln. of the mixt. tested with  $Fe^{III}$  salt from time to time.  $Na_2C_4H_5O_6$ ,  $KC_2H_5O_2$ ,  $Na_2HPO_4$ ,  $Na_2B_4O_7$ ,  $Pb_2(C_2H_5O_2)_2$ ,  $(CH_3)_2N_4$  and antipyrine are incompatible.  $C_6H_5OH$  causes liquefaction. Salol, menthol, thymol, phenacetin, phenolphthalein,  $MgSO_4$  and  $NH_4Cl$  cause no change. L. E. W.

**Medicinal charcoal.** R. L. CALVERT. *J. Am. Pharm. Assoc.* 11, 798-9 (1922).—Moist medicinal charcoal adsorbs less than 1% of  $CO_2$ , but it markedly inhibits fermentation of  $C_6H_5O_2$  with yeast. L. E. W.

**Volumetric determination of sodium salicylate.** M. W. EVANS. *J. Am. Pharm. Assoc.* 12, 225-8 (1923).—Weigh about 0.8 g. of Na salicylate, dissolve in  $H_2O$  and make up to 250 cc. To 25 cc. of the soln. in a glass-stoppered flask add 30 cc. of 0.1 N  $Na_2CO_3$  soln. and 33 cc. of 0.1 N I soln., gradually warm the contents of the flask, loosening the stopper occasionally, until the ppt. turns purple. Cool, allow to stand 15 min., acidify

with dil.  $H_2SO_4$  and shake. Filter and titrate the filtrate with 0.1 N  $Na_2S_2O_8$ . Triplicate assays from the soln. should be made. Three com. specimens gave 99.72, 99.54 and 99.59%.

L. E. WARREN

**Some notes on extract of cascara and cascara extraction.** F. W. NITARDY. *J. Am. Pharm. Assoc.* 12, 495-8(1923).—The U. S. P. IX prescribes that  $MgO$  shall be used as a drying agent in the prepn. of cascara ext. Expts. were undertaken to det. whether the use of  $MgO$  lessened the therapeutic value of the ext., but they were not conclusive, the probability being that no injury results. The extractives by various solvents and in succession were detd., the mare being dried after each extn.  $Et_2O$  4, acetone 10,  $EtOH$  11, dil.  $EtOH$  9, and hot  $H_2O$  1.7%. In the reverse order hot  $H_2O$  27, dil.  $EtOH$  4.5,  $EtOH$  3, acetone 0.35 and  $EtOH$  0.3%. No method for removing the bitter principle without some loss of therapeutic activity was discovered. L. E. W.

**A comparison of cane and beet sugar for pharmaceutical purposes.** ADRIAN THOMAS. *J. Am. Pharm. Assoc.* 12, 498-503(1923).—Four samples of cane sugar and 4 of beet were compared for loss on drying, ash, protein ( $N \times 6.25$ ) and invert sugar. Moisture, cane 0.02-0.035%, and 0.03-0.05% for beet; ash, cane 0.01-0.02% and 0.005-0.01% for beet; protein, cane 0.018-0.075% and 0.00-0.013% for beet; invert sugar, cane 0.013-0.030% and 0.003-0.02% for beet. Bacteriol. tests indicated that the cane sugars contained a less number of organisms than the beet samples. The organisms were not identified but they belonged to the *Mucor*, *Aspergillus* and *Penicillium* groups. Sirups were made from each specimen and each prepn. was divided into portions, the latter being kept under varying conditions of storage. No difference could be noted between the two kinds of sugars by this test. The polariscope examin. failed to reveal any differences. From the evidence T. concludes that either sugar may be used with equally good results for all pharmaceutical purposes. L. E. WARREN

**Review of methods of assaying oil of bitter almond.** JAMES L. HASTINGS. *J. Am. Pharm. Assoc.* 12, 769-73(1923).—Oil of bitter almond is assayed for HCN and for  $C_6H_5CHO$ . The U. S. P. method for the assay of each constituent is inaccurate as a consequence of indistinct end points and the frequent formation of a ppt. before the end point is reached. H. used this gravimetric method for HCN: Dissolve 1 g. of the oil in 15 cc. of 95%  $EtOH$  in a stoppered flask, add 10 cc. of 10%  $NH_4OH$  and 15 cc. of  $AgNO_3$  soln., acidify the mixt. with  $HNO_3$ , shake the flask, collect the  $AgCN$ , dry and weigh in the usual way. The method is accurate. For  $C_6H_5CHO$  3 methods were tried of which the gravimetric only was dependable. The method adopted is similar to that described in the U. S. P. IX, except that the ppt. is collected, dried and weighed instead of titration of the excess of acid in the filtrate. The method gives 96.8% of the amt. theoretically present.

L. E. WARREN

**A method for the estimation of aloin in aloes.** C. H. BRIGGS. *J. Am. Pharm. Assoc.* 12, 774(1923).—Dissolve 50 g. powd. aloes in 300 cc. of boiling  $H_2O$ , add 4 cc. 25%  $AcOH$ , mix and allow to cool. Decant the clear soln. into a 500 cc. graduate, and wash the residue with  $H_2O$  either by decantation or on a filter as practicable. To the filtrate add a soln. in  $H_2O$  of 10 g. of  $Pb(C_2H_5O_2)_2$ , or 15 g. if the drug be very black, and dil. to 500 cc. Shake and filter with suction. Remove the  $Pb$  from the filtrate with  $H_2S$  and again filter with suction. Evap. 400 cc. of the filtrate to 80 cc. in a vacuum. Transfer to a 50-cc. graduate using wash water to a total vol. of 40-43 cc. Allow the aloin to crystallize 24 hrs. Filter with suction and wash the crystals with aloin-satd.  $H_2O$ , dry and weigh. After several hrs. exposure to the air to absorb hygroscopic  $H_2O$  the crystals should be reweighed to represent the aloin of manufacturing custom. Triplicate assays should be carried out and the highest value reported. The method is tedious and is otherwise not ideal, but it gives a good indication of the aloin that can be obtained in manufacturing processes.

L. E. WARREN

**Analysis of some dolomol compounds.** ANON. *Repts. Lab. Am. Med. Assoc.* 15, 54-5(1922).—The dolomol products are manufd. by Brewer and Co. *Dolomol-Iodine*.—This is claimed to contain 5% of free iodine. Analysis showed less than 0.1% of free I. Since the dolomol base is claimed to be a stearo-palmitate of  $Mg$  not much free I would be expected. *Dolomol-Acid Boric*.—Claimed to contain 29% of  $H_2BO_4$ . Found 20.7%. *Dolomol Calomel*.—Claimed to contain 25% of calomel. Analysis showed Hg equiv. to 24.5% of  $HgCl_2$ .

L. E. WARREN

**Notes on quinidine and quinidine sulfate.** L. E. WARREN. *Repts. Lab. Am. Med. Assoc.* 15, 55-60(1922).—Quinidine has recently attracted much attention because of its newly discovered application in the treatment of auricular fibrillation. The market brands of quinidine and quinidine sulfate were examd. with the view of their inclusion in New and Nonofficial Remedies. Quinidine is described in the literature as contg. 1.5 or more  $H_2O$ . Analysis of specimens showed 10.83, 9.72, 10.79, 10.54 and 2.30% of

$H_2O$ . Ash and foreign cinchona bases were negligible. Each m. at 169-70°. Each was of good quality. Standards were elaborated which require practical insol. in  $H_2O$ , soly. in EtOH,  $Et_2O$ , and  $CHCl_3$ ; a limit of 11% of loss on drying, and negligible ash. Quinidine is distinguished from quinine by the insol. of its iodide and from most other alkaloids by the formation of a Ag compd. with  $AgNO_3$ . Three specimens of quinidine sulfate were examd. Each was of good quality. Loss on drying at 100°, 4.53, 4.54, and 4.57%. The dried salt absorbs moisture on exposure to moist air, equiv. to most of its previous loss. The sulfates of cinchonidine, cinchonine, quinine and quinidine in soln. were each tested by 18 of the less common alkaloidal reagents and the findings tabulated. By means of this table and observation of the optical activity it is possible to distinguish and identify the several alkaloids mentioned.

L. E. WARREN

**Notes on theocin.** ANON. *Repts. Lab. Am. Med. Assoc.* 15, 61(1922).—Theocin is a proprietary form of theophyllin, which latter is official. The U. S. P. tests for theophyllin were applied to the specimen of theocin. The U. S. P. states that theophyllin is sol. in 100  $H_2O$  at 25°. Theocin was found to be sol. in about 121.2 parts of  $H_2O$  at 25°.

L. E. WARREN

**Otitia.** ANON. *Repts. Lab. Am. Med. Assoc.* 15, 61-3(1922).—Otitia is sold by Clarke W. Mangum of Iowa Falls at \$5.00 for a 1-oz. bottle. Analysis indicated 1.8 grains of quinine dihydrochloride per fl. oz. in a medium of 59%  $C_2H_5(OH)_2$  in  $H_2O$ .

L. E. WARREN

**Sulfarsenol.** ANON. *Repts. Chem. Lab. Am. Med. Assoc.* 15, 63-5(1922).—Sulfarsenol is sold by Charles Leich and Co. Analysis indicated that sulfarsenol is an arsphenamine deriv. closely resembling nearsphenamine, but the exact constitution was not detd.

L. E. WARREN

#### Analysis of benzoates and salicylates (PRIDEAUX, BENTLEY) 7.

**Synthetic drugs.** CHEMISCHE FABRIK AUF AKTIEN (VORM. E. SCHERING). Brit. 198,379, May 28, 1923. Addn. to 158,558 (C. A. 15, 2154). The process of the principal patent, for melting together C,C-diethylbarbituric acid and 4-dimethylamino-2,3-dimethyl-1-phenyl-5-pyrazolone to form a new compd., is modified by substituting any C,C-deriv. for the diethyl compd. Examples show the prepn. of compds. with the use of dipropyl-, diallyl- and phenylethyl-barbituric acids, resp.

**Sodium compound of dihydroxydiaminoarobenzene.** U. SUZUKI. U. S. 1,468,618, Sept. 18. Dihydroxydiaminoarobenzene-HCl dissolved in MeOH is treated with NaOH to produce the Na salt. Cf. C. A. 17, 1109.

**Papaverine nitrite.** H. STENZL. U. S. 1,468,607, Sept. 18. Papaverine nitrite is formed by treating papaverine sulfate with  $NaNO_2$  in  $C_2H_5$  or other suitable solvent.

**Medicinal preparations; colloidal sulfarsenites.** M. E. WOLVEKAMP. Brit. 197,060, Feb. 14, 1922. Colloidal Hg and Ag sulfarsenites are obtained in neutral soln. or in solid sol. form, suitable for the treatment of syphilis, by reacting upon an alkali sulfarsenite with a Hg or Ag compd. in the presence of a protalbinate or lysalbinate which acts as a protective colloid. Mono-mercury sulfarsenite,  $As_2S_3HgS$ , and tri-mercury sulfarsenite,  $As_2S_3Hg_3S$ , are obtained by dissolving  $As_2O_3$  in  $Na_2S$ , adding HCl, and pouring the mixt. into a soln. of Na protalbinate and  $HgCl_2$ , adding more HCl, and evapg. to dryness, the proportions of  $Na_2S$  and  $HgCl_2$  being different in the two cases. Mono-silver sulfarsenite,  $As_2S_3Ag_2S$ , is obtained by dissolving  $As_2O_3$  in  $Na_2S$ , adding  $H_2SO_4$ , and pouring the mixt. into a soln. of Na protalbinate and  $AgNO_3$ , adding more  $H_2SO_4$ , filtering off the ppt., and after washing, dissolving in dil. soda and finally evapg. to dryness at 100°.

**Organic-mercury compounds.** M. E. WOLVEKAMP. Brit. 196,431, Feb. 14, 1922. Sec U. S. 1,412,440 (C. A. 16, 2199).

**Tooth paste.** E. BERGVE. U. S. 1,467,024, Sept. 4. Titanic acid and silica gel are used together in a tooth paste, with other ingredients such as abrasants, gum arabic and K H tartrate.

**Dentifrice.** O. F. SCHMID. U. S. 1,467,455, Sept. 11.  $KClO_3$  12, pptd.  $CaCO_3$  33, glycerol 10, sugar 10, tasteless mineral oil 5, menthol 0.5, "flavoring" 1.5, starch 3, gum tragacanth 0.5 and  $H_2O$  24.5 parts.

**Pyrorrhæa remedy.** T. CLIFTON. U. S. 1,466,578, Aug. 28. Myrtle root 2 lbs. is boiled in 1 gal. of  $H_2O$  until the decoction is reduced to about  $1/4$  its original bulk and the ext. thus obtained is mixed with honey 1 oz., borax 61 grains, alum 15 grains and alc. 1 gill.

**Radioactive vacuum tube.** L. WINKELMANN. U. S. 1,466,777, Sept. 4. A radio-

active ore or other substance is used with vacuum elements contg. elec. terminals, e. g., therapeutic emanation app. for the purpose of treating cancer and other diseases.

**Radioactive plastic masses.** E. SEYFFERTH AND RHEINISCHE-WESTFAELISCHE SPRENGSTOFF AKT.-GES. ABTEILUNG NURNBERG VORM. H. UTENDOERFER. Brit. 196,518, June 28, 1922. Radioactive plastic masses intended for therapeutic and other purposes are made by incorporating radioactive materials into celluloid and similar plastic substances during the course of their manuf. The products can be molded to any desired shape.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

**Aluminium and bauxite.** R. J. ANDERSON. *Mineral Ind.* 31, 8-37(1922).—The Al market, production, and trade in the United States and foreign countries; technology of Al and light alloys, bauxite production and technology, aluminum abrasives and refractories, and Al salts are discussed. A. B.

**Antimony.** H. K. MASTERS. *Mineral Ind.* 31, 38-45(1922).—The market and world's production of Sb are reviewed. A. B.

**Arsenic.** V. C. HEIKES. *Mineral Ind.* 31, 46-52(1922).—A discussion of supplies and market, with statistics of production in the United States and other countries. A. B.

**Arsenic in 1922.** V. C. HEIKES AND G. F. LOUGHIN. U. S. Geol. Survey, *Mineral Resources of U. S., 1922*, Pt. I, 53-76(preprint No. 6, published Sept. 17, 1923). E. H.

**Asbestos.** OLIVER BOWLES. *Mineral Ind.* 31, 53-62(1922).—Properties and uses, market, production, and trade are treated. A. B.

**Barium and strontium.** J. B. PIERCE, JR. *Mineral Ind.* 31, 70-6(1922).—A statistical review, with flow-sheets of barytes preparation and lithopone manufacture. A. B.

**Bismuth.** C. P. LINVILLE. *Mineral Ind.* 31, 77-9(1922).—Market, production, and uses are reviewed. A. B.

**Borax.** A. T. WARD. *Mineral Ind.* 31, 80-3(1922).—The world's sources and production are given. A. B.

**Bromine and iodine.** ANON. *Mineral Ind.* 31, 84-5(1922).—Production and notes on I extn. in Chile are given. A. B.

**Cadmium.** C. P. LINVILLE. *Mineral Ind.* 31, 85-7(1922).—Sources, production, and technology are discussed. A. B.

**Cryolite.** ANON. *Mineral Ind.* 31, 257(1922).—Figures of production and imports are given. A. B.

**Fluorspar.** H. W. DAVIS. *Mineral Ind.* 31, 262-6(1922).—A review of production, consumption, and imports. A. B.

**Fuller's earth.** ANON. *Mineral Ind.* 31, 267-8(1922).—Statistics of production and imports are given. A. B.

**Fuller's earth in 1922.** JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S., 1922*, Pt. II, 69-71(preprint No. 11, published Sept. 15, 1923). E. H.

**Graphite.** B. L. MILLER. *Mineral Ind.* 31, 347-53(1922).—Statistics of production and trade are given. A. B.

**Gypsum.** F. A. WILDER. *Mineral Ind.* 31, 354-60(1922).—Production in the United States and other countries is discussed, with statistics and a bibliography. A. B.

**Magnesite.** S. H. DOLBEAR. *Mineral Ind.* 31, 451-6(1922).—A statistical review, with notes on foreign production. A. B.

**Magnesium and its compounds in 1922.** J. M. HILL AND G. F. LOUGHIN. U. S. Geol. Survey, *Mineral Resources of U. S., 1922*, Pt. II, 41-57(preprint No. 8, published Sept. 20, 1923). E. H.

**Mica.** ANON. *Mineral Ind.* 31, 471-7(1922).—A review of market, production, and trade in the United States and other countries. A. B.

**Monazite.** ANON. *Mineral Ind.* 31, 482-5(1922).—Sources, utilization, and production are reviewed. A. B.

**Phosphate rock.** WM. H. WAGGAMAN. *Mineral Ind.* 31, 553-68(1922).—A review of the world's sources and production, with notes on technology and a bibliography. A. B.

**Potash.** F. W. BROWN. *Mineral Ind.* 31, 581-5(1922).—Domestic and foreign production are discussed, with statistics and a bibliography. A. B.

**Selenium and tellurium.** S. SKOWRONSKI. *Mineral Ind.* 31, 621-5(1922).—A review of production and technical progress, with a bibliography. A. B.

**Sodium salts.** A. G. WIKOFF. *Mineral Ind.* 31, 626-39(1922).—Production and trade are reviewed with statistics, including nitrate, carbonate, and chloride. A. B.

**Strontium in 1922.** G. W. STROZ. U. S. Geol. Survey, *Mineral Resources of U. S., 1922*, Pt. II, 50-61(Preprint No. 9, published Sept. 12, 1923). E. H.

**Sulfur, pyrite and sulfuric acid.** A. E. WELLS. *Mineral Ind.* 31, 640-57(1922).—A review of production, trade, and technology, including foreign countries. A. B.

**Talc and soapstone.** F. B. PECK. *Mineral Ind.* 31, 658-66(1922).—Markets, trade, production and consumption, and properties are discussed. A. B.

**Titanium and zirconium.** J. W. MARDEN. *Mineral Ind.* 31, 687-97(1922).—Production, uses, and technology are discussed. A. B.

**Uranium and vanadium.** R. B. MOORE. *Mineral Ind.* 31, 711-7(1922).—A discussion of sources, production, and ore treatment. A. B.

**Hydrated silica.** G. DUROCHER. *Industrie chimique* 9, 533-8(1922).—A description of the various actual and possible uses of hydrated  $\text{SiO}_2$ , including colloidal  $\text{SiO}_2$  ("silica gel"). A. P.-C.

**Conversion of alkaline earth sulfates into chlorides.** P. P. BUDNIKOV AND E. A. SHLOV. *J. Soc. Chem. Ind.* 42, 297-8T(1923).—The sulfates of Ba, Sr and Ca can be converted into chlorides by the action of gaseous  $\text{S}_2\text{Cl}_2$  at a temp. of about 1000°. The conversion is much more complete if  $\text{SiO}_2$  is used as a catalyst. The excess  $\text{S}_2\text{Cl}_2$  can be condensed and used again.  $2\text{BaSO}_4 + 2\text{SiO}_2 \longrightarrow 2\text{BaSiO}_4 + 2\text{SO}_2 + \text{O}_2$ ;  $2\text{BaSiO}_4 + 2\text{S}_2\text{Cl}_2 \longrightarrow 2\text{BaCl}_2 + 2\text{SiO}_2 + \text{SO}_2 + 3\text{S}$ . Experimentally, this is done in an elec. furnace by mixing equiv. amounts of sulfate and  $\text{SiO}_2$  and passing  $\text{S}_2\text{Cl}_2$  over the material at a temp. of 1000° for 1 hr. With the natural ore barytes a yield of 97.7% was obtained. E. F. PERKINS

**Three notable fires in pyroxylon plastic manufacturing plants.** W. D. MILNE. *Quart. Nat. Fire Protection Assoc.* 17, 71(1923).—Description and discussion of fires. Most satisfactory provision for scrap storage is to erect isolated storage buildings of not over ten tons capacity each. C. L. JONES

Normal and acid sulfates of Na (PASCAL, Brož 2. Catalytic apparatus (Brit. pat. 199,872) 1. Hydrogen (Brit. pat. 195,798) 21. K compounds from cement mixtures (U. S. pats. 1,465,833, -841, -907) 20.

**Sulfuric acid.** W. F. LAMOREAUX. Brit. 198,332, Feb. 23, 1923. See U. S. 1,456,064 (C. A. 17, 2478).

**Sulfuric acid.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Brit. 195,960, March 29, 1923. In the production of  $\text{H}_2\text{SO}_4$  by the Pb process, a pure acid is obtained by using purified gases for the reaction and by withdrawing gases from the Pb chamber into a tower or app. of incorrodible material where the acid is condensed. A suitable app. is specified.

**Nitric acid.** T. TWYNMAM. Brit. 196,357, Jan. 19, 1922. The exhaust gases from large gas engines actuated by coke oven gas are cooled and scrubbed with a jet of  $\text{H}_2\text{O}$  or steam in order to obtain  $\text{HNO}_3$ . High compression and an excess of air or O are advantageous factors. A suitable construction is specified.

**Hydrochloric acid.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Brit. 196,258, March 19, 1923. HCl produced in the manuf. of chlorobenzene and other chlorinated org. substances is purified by passing it over C or charcoal of high adsorption or decolorizing power, e. g., such as is prep'd. in the manner described in 10,126, 1914 (C. A. 9, 2801).

**Furnace adapted for manufacture of hydrochloric acid and salt cake.** L. B. SKINNER. U. S. 1,467,509, Sept. 11. A substantially continuous muffle hearth has depressions substantially throughout its entire length, and stirring devices which sweep across these depressions and which remove material deposited in the depressions. Cf. C. A. 16, 3367.

**Ammonia synthesis.** L. CASALE. Brit. 197,655, Apr. 5, 1923. Addn. to 194,740. To avoid overheating of the catalyst in the synthesis of  $\text{NH}_3$ , the reaction gases are passed over the catalyst along with a predetd. quantity of the reaction product. This is preferably effected by withdrawing only a part of the  $\text{NH}_3$  as it is formed, the remainder being allowed to circulate with the reaction gases. The  $\text{NH}_3$  synthesis may take place

under any pressure conditions and catalysts may be used which are active at temps. lower than those usually employed. Cf. C. A. 17, 3575.

**Ammonia, soda and carbon acids as blast-furnace by-products.** K. P. McELROY. U. S. 1,466,628, Aug. 28. In the operation of a blast furnace making Fe or Fe alloy, gases laden with cyanide vapor are withdrawn from the hot zone while adding to the charge Na compds. such as  $\text{Na}_2\text{CO}_3$  to facilitate cyanide production. Cyanide-bearing material is collected from the gases which are withdrawn, steamed to produce  $\text{NH}_3$  and the steamed material is treated with lime to obtain caustic alkali. Na oxalate also may be formed and recovered.

**Ammonium chloride.** HENKEL ET CIE AND W. WEBER. Brit. 195,947, March 7, 1923. In the evapn. of solns. contg.  $\text{NH}_4\text{Cl}$ , such as the residual liqus from the  $\text{NH}_3$  soda process, in order to obtain  $\text{NH}_4\text{Cl}$ , corrosion of the Fe vessel is prevented by the passage of a weak direct elec. current through the liquor. A current of 0.1 amp. per sq. dm. of the wetted surface of the evapg. vessel which acts as the cathode is employed. Although the anode is made of Fe, technically pure  $\text{NH}_4\text{Cl}$  is obtained.

**Ammonium sulfate.** P. PARRISH. U. S. 1,467,193, Sept. 4. Colorless  $(\text{NH}_4)_2\text{SO}_4$  is prep'd. from ammoniacal liquor contg. CN compds. by distg. the liquor, fixing the CN compds. in it with a polysulfide, e. g.,  $\text{NH}_4$  polysulfide, and receiving the  $\text{NH}_3$  vapors free from CN derivs., in  $\text{H}_2\text{SO}_4$ .

**Ammonium sulfate.** G. A. PHILLIPSON. Brit. 196,115, Jan. 26, 1922. In a process for simultaneously drying and neutralizing commercial  $(\text{NH}_4)_2\text{SO}_4$  the latter traverses a series of superposed externally heated chambers in each of which the sulfate is agitated and subjected to the action of  $\text{NH}_3$ . A suitable app. is specified.

**Ammonium nitrate and aluminum hydroxide.** A. FOSS and T. MEJGOLT. U. S. 1,464,984, Aug. 14. Solns. contg.  $\text{Al}(\text{NO}_3)_3$  are boiled to expel  $\text{HNO}_3$  and ppt. a basic Al nitrate; the latter is treated with  $\text{NH}_3$  and the  $\text{Al}(\text{OH})_3$  thus pttd. is filtered off.

**Alkali thiosulfates; barium salts.** RHENANIA VEREIN CHEMISCHE FABRIKEN AKT.-GES. ZWISCHNERDELLASUNG MANNHEIM AND F. RUSBERG. Brit. 197,898, Jan. 23, 1923. Alkali thiosulfates are obtained by passing  $\text{H}_2\text{S}$  into a soln. of alkali bisulfite and sulfite. The  $\text{H}_2\text{S}$  is advantageously obtained by lixiviating crude BaS and treating the soln. with  $\text{CO}_2$  or  $\text{HCl}$  or similarly acting substance; or by treating crude BaS mixed with  $\text{H}_2\text{O}$  with an acid such as dil.  $\text{HCl}$  or  $\text{HNO}_3$  or a similarly acting substance such as  $\text{MgCl}_2$ , the corresponding Ba salts being obtained in either case.

**Sodium hydroxide.** COURTAULDS, LTD. AND R. O. JONES. Brit. 197,198, May 16, 1922. Solns. of  $\text{NaOH}$  obtained by causticizing strong solns. of  $\text{Na}_2\text{CO}_3$  with  $\text{CaO}$  and filtering are concd. by cooling to between  $0^\circ$  and  $-15^\circ$  to remove the  $\text{Na}_2\text{CO}_3$  as decahydrate. In this way solns. contg. 15 to 25%  $\text{NaOH}$  and not more than 1%  $\text{Na}_2\text{CO}_3$  may be obtained. Instead of causticizing in the usual manner the process described in 182,661 (C. A. 16, 4303) may be used. Cf. C. A. 17, 186.

**Treating Seales Lake brine.** H. W. MONSE. U. S. 1,468,389, Sept. 18. During the solar evapn. of Seales Lake brine, the sulfate content is controlled by the use of a brine high in carbonate to start the pond operation and the gradual addn. of raw brine (conc'd. by preliminary evapn. at such a temp. as will prevent the sepn. of solid K salts) to the prep'd. brine. The operation is conducted so that the original high carbonate and low sulfate content are restored by evapn. before further addns. of raw brine to the pond are made. This mode of operation facilitates obtaining a rich K salt soln. U. S. 1,468,390 specifies treating Seales Lake brine by heating in the presence of solid  $\text{NaCl}$  to remove a portion of the sulfate content. The brine is then subjected to solar evapn. to produce a soln. high in carbonate and brine contg. substantially the full K salt content of Seales Lake brine is then added after preliminary evapn. at such a temp. as will prevent sepn. of solid K salts. Evapn. is then continued to restore the high carbonate content of the brine. Cf. C. A. 17, 453.

**Evaporating brine.** W. E. GRASS. Brit. 195,675, Nov. 2, 1921. In making salt from brine, satd. brine is heated by being passed as cooling agent through the tubes of a condenser for condensing low-pressure steam in a power plant, and the heated brine evapd. by exposure to the air, the salt crystals being removed and the residual liquid again used as cooling agent in the condenser.  $\text{Ca}(\text{HCO}_3)_2$  and  $\text{CaSO}_4$ , which normally occur in natural brine, prevent corrosion of the brass tubes, and addns. of these substances are made if they are not present. The evapn. of the brine may be effected by passing it down cooling towers contg. wooden laths on which the salt is deposited, or by spraying it over smooth solid surfaces such as enameled metal surfaces, or steel surfaces coated with pitch or bituminous varnish. Cf. 29,698.

**Recovering potassium compounds from brines.** C. E. DOLBEAR. U. S. 1,466,352, Aug. 28.  $\text{NH}_3$  is added to brines such as Seales Lake or Deep Springs (Cal.) brines and

the brine is kept in agitation to convert KCl into  $K_2SO_4$  (by reaction with  $Na_2SO_4$  first pptd.) and cause its pptn. U. S. 1,466,353 specifies a similar process except that  $Na_2SO_4$  or other sol. sulfate is also added to the brine to ppt.  $K_2SO_4$ . Cf. C. A. 16, 469.

**Sodium chromate.** E. BAUMGARTNER. Brit. 197,223, June 15, 1922.  $Na_2CrO_4$  is obtained by heating in a current of hot air in a muffle, a mixt. of Cr ore with  $Na_2CO_3$  with or without CaO or  $CaCO_3$ . The materials are formed into briquets and are arranged in the muffle, for instance in rows with spaces between, so as to allow contact with the current of air. Stirring or turning of the charge is unnecessary and undesirable and the operation is complete in one burning.

**Sodium decaborate direct from boron ores.** A. A. KELLY. U. S. 1,468,366, Sept. 18. See Can. 216,377 (C. A. 16, 2014).

**Producing cyanide in a blast furnace.** K. P. McELROY. U. S. 1,466,628, Aug. 28. A pool of liquid NaCN is maintained in a reaction chamber in contact with C and soda and C are fed to the pool while heating it by partial combustion of the C with pre-heated air to form CO. Cyanide vapor is removed and treated to recover the cyanide. U. S. 1,466,627 relates to a similar method in which the reaction charge is electrically heated.

**Sodium fluoride.** H. HOWARD. U. S. 1,464,991, Aug. 14. HF gas and  $NH_3$  soln. are simultaneously added to a soln. of  $NaNO_3$  or other salt more sol. than the fluoride of the metal component of the salt, the addn. being made at such a rate as to maintain the reaction mixt. practically neutral during the production of NaF. The NaF is crystd.,  $AlF_3$  is added, artificial cryolite sepd. and  $NH_4NO_3$  is then recovered from the mother liquor.

**Sodium fluoride.** H. HOWARD. U. S. 1,464,990, Aug. 14. HF and  $NH_3$  soln. are simultaneously added to a soln. of NaCl to form NaF without loss of the reacting substances by volatilization.

**Alumina.** M. BUCHNER. Brit. 195,998, Oct. 12, 1921. Pure  $Al_2O_3$  is pptd. by means of  $NH_4$  from the soln. obtained by lixiviating aluminous material rendered sol. by fluxing with a bisulfate. The latter is obtained by heating at normal or reduced pressure, in a sep. operation,  $(NH_4)_2SO_4$  or a double sulfate of  $NH_4$  and an alkali metal, and the  $NH_3$  evolved is utilized in the subsequent pptn. of  $Al_2O_3$ . The fluxing is effected under pressure and in the presence of a small quantity of  $H_2O$ . After the heat treatment the mass is extd. with  $H_2O$  and if the soln. is sufficiently free from Fe is pptd. directly by means of a large excess of  $NH_3$ . When considerable quantities of Fe are present  $NH_4$  alum is formed by the addn. of a satd. soln. of  $(NH_4)_2SO_4$  and is sepd. by crystn. The crystals are washed with a soln. of  $(NH_4)_2SO_4$  and are introduced into a soln. contg. a large excess of  $NH_3$ . The  $(NH_4)_2SO_4$  present in the filtrate from the resulting  $Al_2O_3$  is recovered for reuse. The mother liquor after sepn. of the alum may be used repeatedly for the formation of  $NH_4$  alum, the Fe being removed when necessary by means of  $NH_3$ . It is stated that vessels made of Si, Al, Mg or alloys of these metals or alloys thereof with heavy metals are not attacked when used for the formation of the bisulfate.

**Colloidal antimony sulfides.** M. E. WOLVERKAMP. Brit. 197,061, Feb. 14, 1922. Stable, colloidal Sb tri- and penta-sulfides associated with a salt of a protein are prep'd. by redissolving in alkali the product obtained by pptg. an alk. soln. of a sulfantimonite or of a sulfantimonate with excess acid. In examples colloidal Sb trisulfide is obtained from a soln. contg. tartar emetic,  $Na_2S$ , and Na protalminate, and colloidal Sb penta-sulfide is obtained from a soln. contg. Schlippe's salt and Na protalminate. The soln. of the ppt. obtained by adding  $H_2SO_4$  is redissolved in  $NaOH$  and evapd. at  $100^\circ$  to dryness. Alternatively the solid product may be obtained by adding HCl and alc. to the alk. soln. of the sulfantimonite or sulfantimonate.

**Nitrogen fixation.** K. P. McELROY. U. S. 1,466,624, Aug. 28. Hot cyanide-laden gases from a blast furnace are passed through a layer of adsorptive C and alkali in order to recover cyanide.

**Nitrogen fixation.** K. P. McELROY. U. S. 1,466,625, Aug. 28. A furnace of the general type of a blast furnace or slagging gas producer and provided with the usual tuyeres, slag outlet, metal outlet and charging devices and a gas outlet near the charging devices and another near the hottest zone of the furnace (connected to a heat inter-changer for heating air fed to the tuyeres) is utilized for making Fe or Fe alloy and at the same time producing cyanide.

**Nitrogen fixation.** W. A. NELSON. U. S. 1,465,310, Aug. 21. A current of moist air is passed in contact with a heated mass of clay and C to form  $NH_3$  and  $NH_4OH$  is recovered by condensation.

**Agglomerating nitrogen fixation mixtures or similar materials.** C. T. THORSELL and O. TORFL. U. S. 1,466,571, Aug. 28. C and alkali metal carbonate or similar material is passed through 3 heated rotating cylinders in the first of which it is partially dried to prep. it for agglomerating which takes place in the second cylinder (without additional drying) while in the third cylinder a further drying is effected after agglomeration.

**Nitrogen oxides.** SOC. L'AIR LIQUIDE SOC. ANON, POUR L'ETUDE ET L'EXPLOITATION DES PROCESSES G. CLAUDE. Brit. 196,209, March 29, 1923. N<sub>2</sub>O<sub>4</sub> is made by treating a mixt. of N and O with an elec. arc or other elec. heating such as heated filaments under such a high pressure as will cause the actual partial pressure of N<sub>2</sub>O<sub>4</sub> to be greater than 0.25 atm. (*i. e.*, the partial pressure of N<sub>2</sub>O<sub>4</sub> at its liquefying point at atm. pressure) and then cooling the gas while maintaining the pressure so as to liquefy much of the N<sub>2</sub>O<sub>4</sub>. A suitable construction is specified.

**Nitric oxide.** T. E. SPRINGMANN. U. S. 1,466,604, Aug. 28. Fuel gas and air are both separately preheated to a temp. high enough that by burning the gases a temp. will result at which NO will be formed, the gases are burned together and the combustion products are then immediately cooled by direct contact with the outer surface of a steam boiler to prevent dissociation of the NO produced.

**Producing oxides of nitrogen.** F. H. LONG. Brit. 196,697, Jan. 27, 1922. An elec. app. of the Alsop type for producing oxides of N for use in the manuf. of flour is provided with means for directing the air supplied to the arc through a restricting passage, comprising a deflecting enclosure wholly or in part surrounding the reciprocating electrode and the stationary electrode.

**Hydrogen production.** A. R. GRIGGS. U. S. 1,466,619, Aug. 28. In H production, involving alternate oxidation and reduction of ferruginous material, gases resulting from the reduction phase are utilized in directly heating the reaction material by internal combustion at intervals and in continuously heating it by external combustion. Cf. *C. A.* 16, 1136.

**Phosphorus pentoxide.** R. THRELFALL. Brit. 197,863, July 6, 1922. P<sub>2</sub>O<sub>5</sub> made by burning P in a stream of dry air is condensed at a temp. of 125 to 200° in a compact cryst. form. To avoid the presence of a small amt. of amorphous, bulky variety a portion of the vapor at about 160° is led through a filter contg. glass wool to a second condensing chamber.

**Carbon dioxide.** H. E. STUCKE. U. S. 1,465,954, Aug. 28. A soln. of NaHCO<sub>3</sub> is passed downwardly through narrow closed conduits which are externally heated. Liberated CO<sub>2</sub> is drawn off at the upper end of the conduits and soln. deprived of the CO<sub>2</sub> is drawn off at the bottom. U. S. 1,465,955 relates to an app. for carrying out his process.

**Colloidal solutions.** ODERBERGER CHEMISCHE WERKE AKT.-GES. Brit. 197,966, May 22, 1923. Solis are produced by mech. dispersion of a substance in the dispersion medium in presence of the usual protective colloid and in addn. an electrolyte preferably in the proportion necessary to ppt. the sol. if it were at rest. In examples crude S and lamp black, resp., are colloidalized in H<sub>2</sub>O in presence of glue and NaCl. It is stated that sols of almost any desired concn. are thus obtained, which are only coagulated by extremely strong alkalies or acids. The sols may be further coned. by treatment in a centrifugal app. and may be carefully dried to produce reversible gels.

**Bleaching liquor.** J. BRANDWOOD, T. BRANDWOOD and J. BRANDWOOD. Brit. 196,708, Feb. 2, 1922. Cl is rapidly absorbed in alk. solns. for the production of a bleaching liquor, by introducing Cl into the pump used to convey the liquor to the bleaching tank. Cl may be supplied from cylinders, and the alkali used may be lime or NaOH.

**Catalytic materials.** L. CASALE. Brit. 197,199, May 16, 1922. O is injected under pressure into heated Fe or an alloy of Fe with Mn, Cr, Mo, W, C, etc., until the mass is brought into a state of violent ebullition and part of the oxidation product is vaporized away. Any impurities present in the starting material which are detrimental to catalysis are thereby eliminated. The cooled product may be reduced to the metallic state with H or N-H mixt. The catalysts are for use more particularly in the synthesis of NH<sub>3</sub>, but may be employed for other catalytic operations such as the oxidation of NH<sub>3</sub> to HNO<sub>3</sub> or of CO to CO<sub>2</sub> or for the production of H from H<sub>2</sub>O and CO. The process may also be applied to the regeneration of Fe or Fe alloys whose catalytic efficiency has become impaired. Examples are given.

**Catalytic materials; hydrogen; oxygen; gaseous fuels; internal-combustion engines.** C. E. LAURENT. Brit. 197,647, March 1, 1923. Water vapor is decomposed into its constituent elements by passage at temps. of 125-400° over a catalytic material comprising a mixt. in suitable proportions of (1) a substance of the class of "metallic

"poisons," such as salts of As, Hg, Ag, P, Ba, S, Se, Te, B, cyanides and oxalates, (2) C in the form of graphite, coal, coke, etc., with (3) a metallic salt of Pb, Zn, Sn, Sb, Bi or Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, MgO, etc. The catalytic mixt., examples of which are given, is preferably made up into small balls or into a porous mass. The water vapor, prior to its catalytic decompn., may be mixed with a small quantity of a C-contg. substance, such as gasoline, alc., benzine, acetylene, illuminating gas, and in general, all hydrocarbons and inflammable gases; the resulting gaseous products are useful for lighting, heating, and as motor fuel. An internal-combustion engine employing as fuel a catalytically decomposed mixt. of water vapor and gasoline is shown. A suitable construction is specified.

**Active carbon.** L. T. W. HAMON and T. H. BYROM. Brit. 197,971, Nov. 18, 1921. Peat, lignite, sawdust or other carbonaceous material is satd. under pressure or otherwise with a metallic salt soln. and a sol. phosphate, carbonate or silicate is added to ppt. in the pores of the material an insol. phosphate, etc. The material is then carbonized and sol. matter extd. In an example, Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> and Mg and Ca chlorides are given as suitable salts and H<sub>3</sub>PO<sub>4</sub> as the precipitant HCl, with or without heat, is used to ext. the sol. matter after carbonization, and the C is subsequently dried. The salts obtained in the extn. may be employed in the impregnation of fresh material.

**Active charcoal.** ALGEMEENE NORIT MAATSCHAPPIJ (known as General Norit Co., Ltd.). Brit. 198,328, Jan. 13, 1923. In the production of uniformly active charcoal or the regeneration of spent charcoal of the type in which a carbonaceous material is distd. in the presence of active gases the raw material, which may be the less porous kinds of coal and carbonaceous materials such as brown coal, anthracite, etc., is first granulated or pulverized preferably uniformly and then agitated during the heating and action of the activating gases, the agitation being effected, e. g., by stirring, by rotation of the retort, or by the kinetic action of gases. The raw material may be subjected to a preliminary dry distn. in which the products of distn. are quickly swept away, such as by the passage of practically inert gases. The activating gases specified are steam, CO<sub>2</sub>, CO, air, O, Cl, H, flue gases and generator gases. A suitable construction is specified.

**Charcoal from fruit pits.** S. HILLER and L. A. CLARKE. U. S. 1,465,131, Aug. 14. Raw material to be charred is continuously fed to a kiln and charred by its own combustion under normal atm. conditions while it is being passed through the kiln and is then agitated and aerated to complete oxidation and produce a product which has high absorption qualities. Cf. C. A. 17, 2632.

**Stencil sheets.** A. B. DICK CO. Brit. 195,977, April 5, 1923. A stencil sheet, of the kind in which characters are formed thereon by impact with type or by means of a hand stylus, is prep'd. from a sheet of Yoshino or like paper impregnated or coated with a medium which includes a cellulose ester such as cellulose nitrate or acetate. "Pyroxylan enamel" is preferably used, this being a soln. of cellulose nitrate to which a pigment such as ZnO has been added. A tempering agent may also be added to prevent the enamel drying too hard; this agent consists of castor oil or a similar oil in which the cellulose ester is sol., together with soy bean oil or other oil in which it is not sol., this latter expediting the setting of the medium. Coloring matter such as a dye or C black dissolved or suspended in amyl acetate may be added to the tempering agent. The sheet may be coated by drawing one side of it over the surface of the soln. and draining off the excess by drawing it over a wire or straight edge. If the coating is too sticky powd. soapstone may be dusted over the sheet or it may be laid between sheets of absorbent paper. Further details are given.

**Stereotype matrices.** F. W. WIRTH and "DRESDENIA" MATERN- UND STERETYPIE-ANSTALT C. W. WOEHLER. Brit. 197,438, Feb. 21, 1922. The impression side of an ordinary floss is coated by spraying, painting, etc., with a liquid contg. a heat-insulating medium such as borax and (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and a fermentation-preventing medium such as carbolic acid, coating the back of the floss with paste to which fermentation-preventing medium is preferably added, applying to the past layer a covering sheet of unsized paper or other material impenetrable to the paste, placing the floss on the form and subjecting it to heat and pressure to impress and dry the matrix. A suitable liquid for applying to the floss is composed of 1 kg. of H<sub>2</sub>O, 50 g. of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, 15 g. of borax, 20 g. of boric acid and 3 g. of carbolic acid, the paste being preferably matrix paste with the addn. of dextrin.

**Printing surfaces.** A. R. TRIST. Brit. 196,666, Jan. 23, 1922. Relates to printing surfaces of the kind having ink-repelling areas of Hg or Hg amalgam and consists in applying Au or other metal having a greater affinity for Hg than the metal of which the printing surface is composed, to prevent diffusion and evapn. of the Hg. A sheet of metal to which Hg will adhere or with which it will amalgamate, or a sheet of material

coated with such a metal, is provided with a coating of dichromated fish glue enamel, exposed behind a positive transparency of the required design and washed with cold  $H_2O$  to remove the unaffected parts of the enamel. The remaining parts of the enamel are burnt in, and a layer of Fe or other metal to which Hg will not adhere is chemically or electrolytically deposited on the exposed metal. The burnt in enamel is then removed by caustic alkali and the metal thereby exposed is treated with Hg with which Au is afterwards associated by applying a soln. of a salt of Au. According to the Provisional Specification, a sheet of Cu, or of Fe coated with Cu, is printed with the design in a resist and a soln. of Hg nitrate applied to the unprinted parts of the surface of the sheet.

**Plastic compositions.** R. W. ANDERSON. Brit. 197,601, Sept. 5, 1922. A compn. for covering floors, walls, etc., consists of a filler, such as sawdust, treated with Na silicate soln., calcined magnesite, and  $MgCl_2$ , with or without a coloring matter.

**Asbestos friction fabric.** L. KIRSCHBRAUN. U. S. 1,466,907, Sept. 4. A sheet of unwoven asbestos fiber is satd. with bituminous material and  $PhOH$  and is then treated with formaldehyde and cured to produce a hard strong fabric adapted for use as a facing for clutch rings. Cf. C. A. 17, 1870.

**Plastic composition from gelatin and pentosan derivatives.** C. E. SOANE. U. S. 1,463,331, Sept. 18. A plastic compn. adapted for making heat-cured molded articles is prepd. by mixing arabinose syrup with glue, glycerol and wood pulp or other filler.

**Artificial pearls.** L. BONNET. U. S. 1,466,575, Aug. 28. Drops of glass or enamel are placed on a revolvable metal axle for forming artificial pearls after coating the axle with  $Al_2O_3$  and kaolin or other refractory and readily disintegrated material in order to prevent adhesion.

**Casting basalt, etc.** M. BACCHIOLELLI and A. MELFRED-DEVALS. Brit. 197,713, Jan. 14, 1922. In the manuf. of articles from melted igneous rocks, e. g., basalt, lava, etc., use is made of molds or cores made of a poor conductor of heat, such as asbestos, refractory clay, lava, basalt, etc. The articles are formed by casting the molten material in the molds, or by melting in the molds the material filled in the form of powder or slip.

**Imitation alabaster.** M. GROSSER. Brit. 196,202, May 26, 1922. Alum, which may be partly or wholly replaced in a mixt. of  $Na_2SO_4$  and  $Al_2(SO_4)_3$ , is melted with small addns. of casein and either quicklime or vaseline. A typical compn. consists of 20 parts by wt. of  $Na_2SO_4$ , 20 parts of  $Al_2(SO_4)_3$ , 200 parts of alum, 2 parts of casein, and 1 part of vaseline dissolved in 1 part of spirit. Marble effects can be produced by the addition of coloring matter. The compn. may be applied, by spraying or otherwise, to the inner or outer surfaces of vessels of glass, porcelain, metal, or other materials, or to clay molds which are subsequently removed. The coatings so produced may be of variable thickness and color.

**Fabric for facing brake bands.** W. C. FISHER. U. S. 1,465,389, Aug. 21. An unwoven fabric is formed of asbestos and ground cork together with phenolic condensation product the bulk of which remains on the surface of the asbestos and cork particles in the form of a hard skin.

**Adhesion compositions.** H. EHMSEN. Brit. 195,985, April 9, 1923. An adhesion compn. for belt and friction gears comprises  $Na_2SiO_3$ , a Mg silicate such as talcum, Al silicates, feather alum, and potash or slaked lime. Red boric and animal oil may be added to give the compn. a distinctive appearance.

**Sound box diaphragm.** W. H. DRUMMOND. U. S. 1,466,427, Aug. 28. Diaphragms for phonographs or microphones or other sound boxes are formed of superposed washed films of inner skin of basswood or tulip trees or other natural vegetable materials, which may be reinforced with thin sheet metal or cloth and coated with shellac.

**Composition for phonograph records.** W. T. FORSE, F. W. JONES, JR. and G. WALTERS. U. S. 1,468,608, Sept. 18. Acaroid resin or xanthorrhoea resin is used in nitrocellulose record compns.

**Composition for phonograph records.** W. T. FORSE, F. W. JONES, JR. and G. WALTERS. U. S. 1,468,609, Sept. 18. Acaroid resin is used with cellulose acetate and other materials in forming a record compn.

**Water-shedding mixture for coating glass windshields.** L. S. MORRISSEY. U. S. 1,466,888, Sept. 4. Glycerol is mixed with a smaller amt. of  $NH_3$  and  $H_2O$ . The mixt. may be carried on an absorbent fabric.

**Leak-stopping composition.** F. PETMECKY. U. S. 1,467,005, Sept. 4. A leak-stopping mixt. for use in radiators or other receptacles is prepd. by stirring powd. asbestos and dextrin into boiling  $H_2O$  in the proportions of 1, 2 and 5 parts, resp., and continuing the boiling for a short time after the ingredients are mixed.

**Sealing metal containers.** GENERAL RUBBER CO. AND DEWEY & ALMY CHEMICAL CO. Brit. 196,881, Aug. 10, 1922. A compn. for sealing the seams of Sn or like containers comprises an aq. emulsion of rubber or latex, with or without fillers such as C black, ZnO; colors such as Para Toner, dyestuffs and pigments; soaps, gelatins, gums, cork, paper, starches, inorg. substances, vulcanizing agents, and solvents. The added substances are preferably in the colloidal condition. The latex may contain preservatives such as NH<sub>3</sub>, HCHO, oils, glues, etc. In an example, 1 gal. of latex contg. 35% of rubber is mixed with 50 g. of moistened Para Toner. To this mixt. is preferably added 30 g. of Na stearate, 100 cc. of EtOH, and 200 cc. of H<sub>2</sub>O.

**Treating wood; electric insulators; panels; tubes; inlaid wood.** T. GARE. Brit. 195,661, Oct. 7, 1921. A material solid at ordinary temps. and more or less insol. in H<sub>2</sub>O, such as resin, is applied molten to wood before or during the application of pressure. The material is allowed to solidify before the pressure is removed. The product may be used for elec. insulation. If the wood is bent during the process it retains its bent form after the constraining pressure is removed. Patterns may be impressed on the wood or on sheet metal attached by the filling before the filling solidifies. Tubes may be made by superficial impregnation of wooden cylinders which are then locked in a mold and bored by tapered mandrels. Inlaid products are obtained by pressing a design into the surface of impregnated wood, filling in the design with wood of another color or with sawdust mixed with the filling material and pressing and heating the whole. Na<sub>2</sub>SiO<sub>3</sub> soln., paraffin wax, gum thus, boiled oil, paraffin oil, etc., may be added to the filling material.

**Removing copper deposits.** E. LOTII and W. POPLAWSKI. Brit. 197,498, April 5, 1922. A pasty compn. for removing Cu deposits from Fe or steel surfaces, and particularly from the barrels of ordnance, consists of NH<sub>4</sub> carbonate, a hydroscopic substance such as glycerol, and a thickening agent such as gelatin or agar-agar, with or without a porous material such as sawdust or infusorial earth. An example is given.

**Cleaning silver, etc.** F. A. Box and W. E. Box. Brit. 196,502, May 31, 1922. A cloth for drying and polishing Ag and like plated articles is composed of one-half linen and one-half cotton and is treated with a prepn. consisting of 1 part by wt. of NH<sub>3</sub>, 1 part whiting, and 2 parts water. The cloth is soaked in the prepn., wrung out and dried.

**Cleansing, etc., composition.** E. A. BROWN. Brit. 196,136, Feb. 14, 1922. A powder for cleaning and polishing glass or glazed articles is obtained by mixing 70 parts of pumice, 20 parts of chalk, and 10 parts of French chalk. Coloring matter may be added. The pumice may be replaced by a powder composed of SiO<sub>2</sub> and silver sand.

**Detergents; bleaching agents.** DEUTSCHE GOLD & SILBER SCHEIDANSTALT VORM. ROESSLER, AND O. LIEBKNECHT. Brit. 196,839, June 6, 1922. Solid products for use as detergents and bleaching agents are obtained by causing Na<sub>2</sub>O and NaHCO<sub>3</sub> to react in a soln. of water glass, preferably in the presence of protective substances as, e. g., Mg, Ca or other alk.-earth silicates. H<sub>2</sub>O may be added to increase the % of active O, soda to reduce it. The product is preferably dried to improve its keeping power. In an example, 1 part of peroxide is added to 3 of water glass of 30° Bé, and then 2 mol. of bicarbonate for each one of peroxide. In a second, 200 g. of a 30% Na silicate soln. are mixed with a soln. of 200 g. of MgCl<sub>2</sub>, and added to a mixt. of 500 g. of water glass of 1.3 sp. gr. with 330 cc. of H<sub>2</sub>O. 330 g. of Na<sub>2</sub>O are then stirred in and afterwards 880 g. of 91% NaHCO<sub>3</sub> are added, and the whole is well mixed and ground. On drying, 1750 g. of the product are obtained contg. 3.7-3.8% of active O.

**Cleansing compositions.** G. B. PRIME. Brit. 196,802, April 20, 1922. A cleaning and polishing compn. is prep'd. by adding whiting to an aq. soln. of soda, and mixing in yellow ocher and fuller's earth that have separately been satd. with paraffin oil. The paste may be dried and powdered, or thinned with water.

**Cleansing compositions.** C. J. COLEMAN. Brit. 197,012, Feb. 3, 1922. A compn. for cleaning and polishing metal, glass, woodwork, etc., comprises fibrous material, such as ground asbestos or sawdust, and finely ground siliceous colloidal clay, such as bentonite. Corundum, carborundum, rouge, stannic oxide, amorphous silica, etc., may be added, and the whole made into a paste or fluid mixt. with H<sub>2</sub>O alone, or with H<sub>2</sub>O to which citric acid, oxalic acid, naphthalene, or like solvents of metal oxides and grease have been added, in which case the corundum, etc., may be omitted. In an example, 50 parts by vol. of fibrous material is added to 40-50 parts of colloidal clay and 2-10 parts of corundum, etc. The mixt. may be ground with 160-500 parts of H<sub>2</sub>O to which 1-5 parts of citric acid, oxalic acid or naphthalene is added. When SiO<sub>2</sub> is used, the proportion of this ingredient may be increased to 100 parts.

## 19—GLASS, CLAY PRODUCTS, REFRactories AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**The importance of pure research on glass in American universities.** A. SILVERMAN, *J. Am. Ceram. Soc.*, 6, *The Bulletin* 2, 206-10 (1923).—Problems are outlined and the organization of a glass mfrs. assn. for the purpose of subsidizing this research work is recommended. C. H. KERR

**A study of the origin and cause of stones in glass.** H. ISSLEY, *J. Am. Ceram. Soc.*, 6, 706-16 (1923).—Stones are due to devitrification, undissolved batch material or pieces of refractory walls or crown. The usual devitrification minerals are tridymite, cristobalite, wollastonite, diopside and a new Na-Ca silicate. Incomplete melting causes batch stones. Impurities in the batch often resist melting and remain as stones. Stones from the white layer on the inside of pots are sillimanite and dissolve with difficulty. Stones from tank blocks often contain dehydrated clay as well as sillimanite and dissolve more readily. Stones contg. corundum are of 2 types: (1) stones from tank blocks which contained originally nodules of diaspore, bauxite or gibbsite, (2) stones from fire brick above the glass line, in which corundum was formed due to absorption of Na from the furnace gases. Detn. of structure and optical properties of stones by means of the polarizing microscope often discloses their origin. C. H. KERR

**Proposed tentative specifications for silica sand for glass making.** ANON, *J. Am. Ceram. Soc.*, 6, *The Bulletin* 2, 182-4 (1923).—Proposed by the Standards Committee of the Am. Ceram. Soc.

Quality	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO + MgO
	min. %	max. %	max. %	max. %
First quality optical glass.....	99.8	0.1	0.02	0.1
Second qual. flint glass, containers, table-ware.....	98.5	0.5	0.035	0.2
Third qual. flint glass.....	95.0	4.0	0.035	0.5
Fourth qual. sheet glass, rolled and pol. plate.....	98.5	0.5	0.06	0.5
Fifth qual. sheet glass, rolled and pol. plate.....	95.0	4.0	0.06	0.5
Sixth qual. green glass containers and window glass.....	98.0	0.5	0.3	0.5
Seventh qual. green glass.....	95.0	4.0	0.3	0.5
Eighth qual. amber glass containers.....	98.0	0.5	1.0	0.5
Ninth qual. amber.....	95.0	4.0	1.0	0.5

Tolerances are given. All are based on ignited samples. C. H. KERR

**Recommended specifications for limestone, quicklime and hydrated lime for use in the manufacture of glass.** ANON, *J. Am. Ceram. Soc.*, 6, *The Bulletin* 2, 170-3 (1923).—Proposed by the Standards Committee of the Am. Ceram. Soc. The terms are defined. Any lime contg. more than 83% CaO + MgO is suitable for glass making if the deleterious ingredients are within reasonable limits. The compn. should not vary over 2% from day to day. All should pass 16 mesh.

	Composition of the non-volatile portion of limestone, quicklime or hydrated lime				
	CaO + MgO	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub> + P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub> + P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>
	min.	max.	max. in limestone	max. in quick or hyd.	max.
Class 1.....	96	0.2	1.0	3.0	4.0
Class 2.....	91	0.4	1.0	3.0	9.0
Class 3.....	83	0.8	1.0	3.0	17.0

C. H. KERR

**Lime as a glass-melting material.** L. SPRINGER, *Sprechsaal*, 56, 188 (1923); *J. Soc. Glass Tech.*, Abstr. Sec. 7, 78.—Instances were furnished which demonstrated the need of the chem. control of samples of lime used in glass works. The degree of fineness of the particles was also important, as also the mineralogical compn. A small expt. in a Pt crucible heated in an elec. crucible furnace showed that a sample of shell-limestone liberated all its volatile material far more readily than did marble. In another case, the development of "stones" followed the use of a new lime; the latter was found to have more insol. matter and less Ca carbonate. Again, another firm had used a local and cheaper marble than their previous limespar. The new melt was not suc-

cessfully worked, and more alkali had to be used, so that the original economy was ineffective, owing to mineralogical differences in the samples. H. G.

**Production of glass wool.** ANON. *Le Verre* 7, (July 1923); *Keram. Rundschau* 31, 338(1923).—A machine made by the Duplex-Machine Co., Marktrewitz, is described.

H. G. SCHURECK

**Further studies on cast glass pots.** R. F. GELLER AND A. N. FINN. *J. Am. Ceram. Soc.* 6, 805-72(1923).—The casting of porcelain glass pots has passed the exptl. stage. The % plastic clay is not of prime importance so long as the body will cast satisfactorily. Proper watersmoking practically eliminates fissures and surface cracks. Pots should be arched to the highest temp. consistent with the refractoriness of the body. C. H. K.

**Furnaces for melting glass.** H. MAURACH. *Fuels & Furnaces* 1, 329-32(1923).—The best utilization of the heat requires heating the roof walls to the limit of what the refractory material will stand, arranging the burner so that the flame strikes the glass surface and placing the ports as low and close to the bath as possible. D. F. B.

**Cold, clean artificial gas and a discussion of the general properties of gaseous fuels [in glass making].** A. E. BLAKE. *J. Am. Ceram. Soc.* 6, 808-30(1923).

C. H. KERR

**The Danish ceramic industry.** CARL JACOBSEN. *Trans. Ceramic Soc.* (England) 22, Pt. I, 20-8(1922-3). E. J. C.

**Washing tests of Georgia clays.** R. T. STULL AND G. A. BOLE. *J. Am. Ceram. Soc.* 6, 730-47(1923).—The "whirlpool classifier" was found more efficient than a simple elutriation process. Plans for a com. plant are suggested. Color is improved and specks are avoided in the washed clay. C. H. KERR

**The fire-brick materials of Pennsylvania.** G. H. ASHLEY. *J. Am. Ceram. Soc.* 6, 837-49(1923).—Penn. produces 40% of the clay fire brick and 70% of the SiO<sub>2</sub> brick of the U. S. Three kinds of materials are used: (1) soft fire clay, (2) hard or flint clay and (3) ganister rock. A mass of data is tabulated. C. H. KERR

**The effect of time and temperature upon the chlorination of flint fire clay.** H. F. KRIEGER. *J. Am. Ceram. Soc.* 6, 850-3(1923).—Two pure clays were tested at temps. of 500-950° and for 17-40 min. The rate of chlorination of flint fire clays increases rapidly with the temp. Data are tabulated. C. H. KERR

**Use of sedimentary kaolins of Georgia in white wares.** G. A. BOLE AND R. T. STULL. *J. Am. Ceram. Soc.* 6, 854-64(1923).—From 26 clays tested, 11 were selected as best and washed. It is concluded that Georgia sedimentary clays can be used to displace all the china clay in a vitrified tile body but less than half the china clay in plastic bodies. The color is greatly improved by the washing. C. H. KERR

**The use of stoneware in chemical industry.** F. MÜLLER. *Z. angew. Chem.* 36, 445-50(1923).—After discussing the general characteristics of stoneware, M. deals in some detail with its phys. properties. The stoneware vessels and app. described and discussed are taken up under the following classifications: (1) cylindrical, conical and bottle-shaped receptacles, (2) storage tanks lined with stoneware plates or tiles cemented together, (3) connecting and conducting pipes for liquids and gases, (4) methods of making joints and connections for pipes under (3), (5) valves, cocks, and seals, (6) cooling and condensing pipes and vessels, (7) stoneware towers and filling, (8) vacuum and pressure containers, (9) vessels with thin walls in which distn., nitration, evapn. and sublimation are to be carried out, (10) machines for mixing, filtering, pumping, etc., etc. Numerous cuts are given. E. G. R. ARDAGH

**Shop notes—the plaster shop.** T. A. KLINEFELTER AND F. C. PARSONS. *J. Am. Ceram. Soc.* 6, 783-5(1923).—A discussion of shop problems in making plaster molds. C. H. KERR

**Proposed tentative specifications covering the purchase of pulverized flint to be used in the manufacture of whiteware.** ANON. *J. Am. Ceram. Soc.* 6, *The Bulletin* 2, 166-9(1923).—Proposed by the Standards Committee of the Amer. Ceram. Soc. SiO<sub>2</sub>, not under 99.60; K<sub>2</sub>O + Na<sub>2</sub>O, not over 0.15; Fe oxides, not over 0.05; CaO, 0.10; MgO, not over 0.10; Al<sub>2</sub>O<sub>3</sub>, not over 0.10%. Fineness:

Sieve No.....	100	140	200	270	325	Total residue
Grade 1.....	0.10	0.2	1.5	2.0	5.0	8.8%
Grade 2.....	0.50	1.0	2.5	3.5	6.5	14.0

**Fusing behavior.**—Test cones shall not deform before cone 24. Procedures of testing are given. C. H. KERR

**Stain and efflorescence on ceramic products.** FRIED. BIGOT. *Rev. matériaux construction trav. publics* 166, 121-2B(1923).—Green stain or efflorescence has been

noted to appear on clay bodies heavily charged with mica. A kieselguhr contg. a notable quantity of Mn showed a similar efflorescence on exposure to humidity. A stoneware clay to which had been added 2.3% chromite, burned to 1200° in an oxidizing fire, developed a green efflorescence on exposure to dampness. Calcareous white bodies used for faience, covered with a heavy Pb glaze, often show a yellow coloration in the glaze characteristic of Pb and Cr; such colorations are not observed in opaque Si glazes. Green stains are produced on clays contg. alkaliies, the alk. earths even in large proportions not preventing the formation of sol. salts. Firing with coal contg. S seems to aid the formation of such stains. *Lead glazes vs. leadless glazes.*—In the manuf. of faience tableware, a yellow stain is often prominent on large pieces requiring time for drying after dipping in a Pb glaze. However, with a leadless, boric acid glaze, no colorations are noticeable. The coloration may be eliminated by (1) bisecturing the body to a temp. high enough to dissociate completely the complex compds. of CaO, SiO<sub>2</sub>, CO<sub>2</sub> and SO<sub>2</sub> (about 1000°), and then using a Pb glaze, or (2) by using leadless glazes (boric acid) instead, with the usual biscuit burn. *Gray colorations.*—A dull gray coloration visible through a transparent glaze was traced to the presence of CaS contained in the plaster of Paris used as a mold. The impurity was introduced by the reduction of the gypsum in the hot part of the kettle fired with lignite, which gives a long flame. Exposing the clay products having the gray coloration to sunlight restores them to their original whiteness in a few days, whereas exposing them in a humid unlighted place required many months for the same result. *Louis NAVIAS*

**Effect of grog additions on the fire resistance of hollow tile.** H. D. FOSTER. *J. Am. Ceram. Soc.* 6, 748-52 (1923).—Tests of 3 kinds of tile contg. various amts. of grog addns. showed that small addns. which can be conveniently made in mfg. practice have no effect, but that addns. of 5% or more will materially decrease the fire resistance. *C. H. KERR*

**The effect of variation in firing on the physical properties of vitreous china bodies.** H. H. SORTWELL. *J. Am. Ceram. Soc.* 6, 315-36 (1923).—The porosity, transverse strength, compressive strength and impact strength of 10 com. china bodies were detd. on trials fired in 3 positions in a kiln in each of 10 potteries. Max. strength existed over a narrower temp. range than that of complete vitrification. Underfiring and over-firing caused marked loss in strength. Specimens of 11 bodies fired at cones 6, 8, 10, 12 and 14 in a lab. kiln showed about the same range in strengths as the trials in com. burns. Highest strength was coincident with complete vitrification and in all bodies occurred at or before cone 12. *C. H. KERR*

**The properties of some clay-like materials of the bentonite type.** H. G. SCHURECHT AND H. W. DOUDA. *J. Am. Ceram. Soc.* 6, 940-8 (1923).—Bentonites appear to be mixts. of 2 or more materials. They are probably mixts. of colloidal silicates and fine-grained kaolinite in varying proportions. When added in small amts. to certain clays, some bentonites greatly increase the dry strength. In firing they vitrify at about 1000°, soften at cones 1-14 and burn buff to brown; hence only small amts. can be used in white ware. It is possible by adding finely ground quartz and small amts. of bentonite to certain fire clays to produce mixts. approaching the Arkansas and certain other glass pot clays. Adding too much bentonite causes cracking in drying. *C. H. K.*

**The analysis of high-alumina products.** C. A. UNDERWOOD. *J. Am. Ceram. Soc.* 6, The Bulletin 2, 152-61 (1923).—With high Al<sub>2</sub>O<sub>3</sub> content, great care must be taken in washing the Al<sub>2</sub>O<sub>3</sub> ppt. Impure Al<sub>2</sub>O<sub>3</sub> and failure to remove the Pt taken up during the fusion will add still further to the error. Details of procedure are given. An analysis total above 100% is usually better than below. *C. H. KERR*

**Testing barium carbonate for use in terra cotta bodies.** W. L. HOWAT AND G. A. WILLIAMS. *J. Am. Ceram. Soc.* 6, The Bulletin 2, 161-3 (1923).—Since the value of BaCO<sub>3</sub> for neutralizing sol. salts in a terra cotta body depends upon its activity when in contact with sol. salts, the amt. of BaSO<sub>4</sub> formed when 2 g. of BaCO<sub>3</sub> sample is added to 100 cc. of 10% soln. of MgSO<sub>4</sub> is taken as an index of its value. If less than 25% reacts with the MgSO<sub>4</sub> the value is doubtful. Detailed procedure is given. *C. H. K.*

**Magnesite production in Austria.** ANON. *Brit. Clayworker* 32, 174 (1923).—The Austria-American Magnesite Co. possesses large well equipped works at Radenthein in Carinthia. The magnesite is so pure that grading and selecting is unnecessary. It is calcined at 1600-1700° in different types of furnaces of which the rotary is the best. After calcination it is put through a magnetic separator. The pulverized coal used is 30-40% of the output tonnage. The calcined product analyzes: MgO 85-88, CaO 1.5-2.5, Fe<sub>2</sub>O<sub>3</sub> 4-5, Al<sub>2</sub>O<sub>3</sub> 1-5, SiO<sub>2</sub> 4-6%. As the fumes are injurious to vegetation the spent gases are carefully purified before being released into the air. Attached to the works is a brick plant where calcined magnesite is mixed with 6-7% H<sub>2</sub>O and pressed into brick

under 1000 kg. sq. cm. They are then fired at 1500-1520° in a tunnel furnace.

H. G. SCHURECHT

**Clay sewer pipe manufacture. II. The effect of variable alumina, silica and iron oxide in clays on some properties of salt glazes.** H. G. SCHURECHT. *J. Am. Ceram. Soc.* 6, 717-29(1923); cf. *C. A.* 17, 3586.—In the tests made low SiO<sub>2</sub> clays contg. 0-1.0% Fe<sub>2</sub>O<sub>3</sub> and high SiO<sub>2</sub> clays contg. 0-2.19% Fe<sub>2</sub>O<sub>3</sub> (in terms of the calcined wt.) produced white to tan glazes. Low SiO<sub>2</sub> clays contg. 1.0-3.5% and high SiO<sub>2</sub> clays contg. 2.19-3.5% Fe<sub>2</sub>O<sub>3</sub> produced light brown glazes. Clays contg. 3.5-4.75% Fe<sub>2</sub>O<sub>3</sub> produced brown glazes. Clays contg. 4.75-8.2% Fe<sub>2</sub>O<sub>3</sub> gave mahogany glazes and those with over 8.2% Fe<sub>2</sub>O<sub>3</sub> gave dark brown to black. With tests made, the formula: 1.00X<sub>1</sub> + 0.376X<sub>2</sub> - 2.923X<sub>3</sub> = 100 G indicated the brightness, G. If G is greater than zero the glaze is bright; if between zero and -0.1337 it is semi-matt; if less than -0.1337 it is matt. The thickness of the salt glaze may be increased up to 600% by increasing the SiO<sub>2</sub> content in a pure clay. **III. The heat distribution in sewer pipe kilns.** *Ibid* 6, 831-6. The heat distribution in 4 kilns was studied. The coolest portions were along the bottom and at the top near the sides, the hottest on the top at the center. Smaller kilns are more uniform than large. C. H. KERR

**A rapid method for preparing a silicate rock flux for dehydration.** G. W. BURKE. *J. Am. Ceram. Soc.* 6, 761-2(1923). To save time in the analysis of a silicate rock or clay, the molten flux is poured into the bore of a steel cylinder resting on an iron plate, a tightly fitting plunger is inserted, the flux is crushed with a hammer and the broken flux is swept into a dish and dissolved in acid. C. H. KERR

**Suggested specifications for ceramic whiting.** ANON. *J. Am. Ceram. Soc.* 6, The Bulletin 2, 173-82(1923).—**Fineness.**—Residue on 140 screen shall not be over 1%, or 2% on 200. A Pearson air separator shall show at least 85% finer than 0.02 mm. and at least 45% finer than 0.01 mm.

	Total carbonates min.	CaCO <sub>3</sub> min.	MgCO <sub>3</sub> max.	Fe <sub>2</sub> O <sub>3</sub> max.	SiO <sub>2</sub> max.	SO <sub>3</sub> max.
Class 1	97	96	1.0	0.25	2.0	0.1
Class 2	97	89	8.0	0.25	2.0	0.1

Methods of testing are given.

**Highly porous insulating brick.** ANON. *Brit. Clayworker* 32, 169-70(1923).

H. G. SCHURECHT

**A continuous filter press for ceramic slips.** ALIX. CORNILLE. *Rev. matériaux constructions trav. publiques* 166, 123-73(1923); *Chem. Age, Supplement* 9, 9-10(1923).—Description of the Herterlein continuous filter press. LOUIS NAVIAS

**Graphite for steel-melting crucibles.** R. T. STULL AND G. A. BOLE. Bur. Mines, Repts. Investigations No. 2512, 6 pp.(1923).—Seven graphites were tested by being made into steel-melting pots with a clay bond which had previously been found to be the best for this purpose. The mix. was composed of 50% graphite, 27% Missouri washed pot clay, 13% Kentucky ball clay No. 4 and 10% sand. After thorough drying the pots were used to melt tool steel, the life of the pot being taken as a measure of the quality of the graphite used. All factors being taken into consideration, the graphites gave service in the following order: Texas, Alabama, Ceylon, Madagascar, New York, Montana and Canada. The first two gave somewhat better service than the commercial pots. The tests are not very extensive or complete, but they indicate that a superior steel melting pot can be made from American graphites bonded with American clays. A. W. OWENS

**The relative magnitudes of radiation and convection heating in a muffle kiln.** J. T. LITTLETON, JR. *J. Am. Ceram. Soc.* 6, 771-6(1923).—The ratio of heating by convection and by radiation in a muffle kiln, 38"×18"×36" high, were each detd. for temps. from 350° to 800°. The ratio of convection to radiation decreases from about 0.4 at 350° to 0.1 at 800° so that for the higher temps. the convection heating may be neglected. C. H. KERR

**Some investigations on kiln burning.** R. M. CAMPBELL. *J. Am. Ceram. Soc.* 6, 886-90(1923).—A complete heat balance is worked out, showing 8.69% efficiency. C. H. KERR

**A new raw material for ceramic uses.** P. E. COX AND D. A. MOULTON. *J. Am. Ceram. Soc.* 6, 937-9(1923).—"A mineral, not heretofore reported, similar to feldspar in analysis but partially colloidal like bentonite," is described. It appears to be superior to Cornwall stone, being more plastic. It functions as a feldspar and also as a plastic clay. C. H. KERR

**Feldspar.** A. S. WATTS. *Mineral Ind.* **31**, 256-61(1922). Production, mining, and treatment are discussed for the United States and Canada. A. B.

**Proposed tentative feldspar specifications.** ANON. *J. Am. Ceram. Soc.* **6**, *The Bulletin* 2, 163-5, 210-25(1923). Proposed by Standards Committee of the Am. Ceram. Soc. *Chem. compn.*—Four grades, A, B, C, and D, are specified: K<sub>2</sub>O, A over 10%; B 9, C 7.8, D not over 3%; Na<sub>2</sub>O, A under 3.6%, B 3.2, C 2.8, D over 7.0%; CaO + MgO, A under 0.75%, B 1.00, C 1.00, D 1.00%; *Fineness*.—A 100 g. sample, dried at 105° is sieved wet.

Screen No.	100	110	200	270	325	Total residue
Grade 1	0.25	0.5	1.25	2.0	5.0	9%
Grade 2	0.50	1.0	2.50	4.0	6.0	11
Grade 3	0.75	1.25	3.75	5.0	8.0	18.75

**Fusing point.**—Grade A, with or before cone 9; B, with or before cone 8; C, between cones 7 and 8; D, with or before cone 7. Procedures for the different tests are given.

C. H. KERR

**A rapid means for the determination of the quartz content of feldspar.** M. C. BOOZE AND A. A. KLEIN. *J. Am. Ceram. Soc.* **6**, 698-705(1923). The quartz content is detd. by making a rapid fusion of the feldspar without dissolving an appreciable amt. of the quartz, crushing the fused mass, immersing a portion of it in a liquid of proper sp. gr. and comparing the visible quartz with standard samples contg. known amts. of quartz. A 5% diff. is easily detected. The test can be completed in 2 hrs. and does not require a knowledge of microscopy. C. H. KERR

**Abrasives.** ANON. *Mineral Ind.* **31**, 1-7(1922).—A review of the abrasives industry. A. B.

**Refractory materials for the construction of furnaces.** THOMAS. *Giescer-Zie.* **10**, 235-7(1923).—Unreliable results are obtained in the detn. of the refractory quality of a material by the Seger cone method, because the stone softens at much lower temps. Far superior is the method of Endell (no reference). The valuation of materials by this method and their use in furnace construction are discussed. C. C. DAVIS

**Requirements of refractories for electric furnaces.** C. E. WILLIAMS. *J. Am. Ceram. Soc.* **6**, 753-60(1923).—An ideal, universal refractory is almost impossible of attainment. Specialized "super-refractories," even at greatly increased cost, are in increasing demand. Important recent developments include higher burning temps., the use of high Al<sub>2</sub>O<sub>3</sub> clays, and increased exptl. work on fused refractories. C. H. K.

**Producer gas for burning refractories.** W. D. RICHARDSON. *J. Am. Ceram. Soc.* **6**, 799-807(1923).—Historical and generally descriptive. C. H. KERR

**The disintegration of refractory brick by carbon monoxide.** B. M. O'HARRA AND W. J. DARBY. *J. Am. Ceram. Soc.* **6**, 904-11(1923).—The expts. illustrate forcibly that disintegration may be caused by the increase in vol. due to deposition of C resulting from the reaction 2CO = CO<sub>2</sub> + C at temps. about 559°. In the absence of catalysts there is no appreciable reaction but metallic Fe is a catalyst and in its presence C deposits readily. Particles of Fe oxide are reduced at low temps. by the CO to metallic Fe, thus causing the trouble. C deposition is not troublesome above about 750-800°. Iron-free fire brick, SiO<sub>2</sub> brick, SiC brick, or chrome brick (low in Fe) are not affected. For lining large Zn condensers iron-free fire brick are good but SiO<sub>2</sub> brick are best. Chrome or SiC brick are satisfactory but too expensive. C. H. KERR

**The suitability of the tunnel kiln for burning refractories.** A. F. GREAVES-WALKER AND S. M. KIER. *J. Am. Ceram. Soc.* **6**, 891-57(1923).—The Dressler tunnel kiln at the Ohio Valley Clay Co., Steubenville, O., has been very successful. The refractories industry would probably save 75% of the fuel now required if tunnel kilns were used. C. H. KERR

**The relative action of acids on enamel.** V. E. P. POSTE. *J. Am. Ceram. Soc.* **6**, 689-97(1923).—Com. cooking ware enamels, as a class, are readily etched by 15% citric acid. The degree of etching is not necessarily proportional to the time of action. The weaknesses of present tests are pointed out but no satisfactory substitute test has yet been devised. C. H. KERR

**Vitreous enameling with electric heat.** E. F. COLLINS. *J. Am. Ceram. Soc.* **6**, 794-8(1923).—Considering reduction of % defective ware, elec. firing is economical. Results with watch dials and with bath tubs are described. C. H. KERR

**Some causes of blistering of sheet steel metal enamels.** G. F. COMSTOCK. *J. Am. Ceram. Soc.* **6**, 873-85(1923).—Microscopic examn. showed 2 distinct kinds of defects. One was characterized by dark spots arranged in streaks and was found to be due to foreign inclusions in the steel. The other defect consisted of irregularly scattered

spots, probably due to gas absorption during pickling. Seventeen excellent photo-micrographs are given.

C. H. KERR

**The use of bentonite for suspending enamels.** M. E. MANSON. *J. Am. Ceram. Soc.* 6, 790-3 (1923).—Bentonite, a highly colloidal clay, has a much greater suspending power than the ordinary enameling clays. One part of bentonite is equiv. to 5 of clay. There may be some practical objections, however, not as yet proven. C. H. KERR

Geology of glass sands (ELKINGTON) 8.

**Glass.** CHANCE BROS. & CO., LTD. AND A. L. FORSTER. Brit. 197,500, April 11, 1922. Relates to glass of the kind in which  $\text{Fe}_2\text{O}_3$  is combined in the ferrous state to enable the glass to act as a good absorber of thermal radiation. According to the invention, the proportion of  $\text{Fe}_2\text{O}_3$  is such that the amt. of FeO per unit area of the glass will give the desired absorption and transmission of thermal and luminous radiations. *E. g.*, hammer scale or Fe oxalate is added in such quantity that the finished glass sheet contains about 0.01 g. of FeO per sq. cc. of surface. It is found that with such a glass, the ratio of luminous radiation transmitted to thermal radiation absorbed is a max. and the glass is suitable for window and roofing purposes in hot countries.

**Reinforced glass.** V. C. EDWARDS. U. S. 1,467,030, Sept. 4. A transparent sheet of pyroxylon compn. is used to reinforce a transparent sheet of glass of such a character as to absorb actinic rays which would tend to cause color changes in the pyroxylon compn.

**Coating glass.** BRITISH-THOMSON-HOUSTON CO., LTD. Brit. 196,843, June 21, 1922. A coating adapted to serve as a substitute for sand blasting is produced on glass by spraying on a compn. contg. talc, French chalk or  $\text{ZnO}$ , or a mixt. of two or more of these and alk. silicate soln. If china clay be used  $\text{NaOH}$  may be added. The dry coating is then immersed in a soln. of Na acid fluoride or a soln. contg.  $\text{NH}_4\text{Cl}$  or  $\text{NaCl}$  and  $\text{H}_2\text{SO}_4$ . App. is specified.

**Ornamenting glass and other ware.** J. B. LESSELL. U. S. 1,467,111, Sept. 4. A non-fusible black pigment or other infusible material is applied to a selected outline on the surface of glass, pottery, metal or the like ware to be decorated and over this material there is applied a coloring liquid, *e. g.*, an orange ground paint. The ware is fired to fuse the coloring matter and excess material is then removed from its surface by brushing.

**Composite metal molds for molding glass.** T. COLEMAN, JR. U. S. 1,466,640, Aug. 28. Molds are formed of a main body of base metal such as Fe with a weld-united coating of substantially non-oxidizable metal.

**Molded glass.** M. A. DEMONGEOT. U. S. 1,465,545, Aug. 21. Granular or powd. material such as glass is heated in a mold to a temp. which will cause softening of the material without causing it to stick to the mold and subjected to a sufficiently high pressure to consolidate the material without need of heating to a higher temp.

**Optical glass.** C. A. PARSONS, C. J. PEDDLE and H. M. DUNCAN. U. S. 1,465,022, Aug. 14. Optical glass is allowed to cool in the pot until it has reached the stage at which it is still viscous but able to retain its shape without support and at this stage is septd. from the pot (*e. g.*, by shearing) in order to avoid cracking from solidification in the pot.

**Liquid lenses.** M. J. GUNN. Brit. 196,312, Oct. 24, 1921. Liquid lenses are constructed of sep. curved glasses of even thickness throughout and are filled with glycerol, preferably chemically pure of approx. 1.260 sp. gr., or with oil of camphor or oil of cedarwood. A certain proportion of gelatin may be added with the object of thickening the filling medium or altering the focal length. In this case formalin or other preservative may be added. A compd. lens is constructed of several lenses as above having different filling media for the better correction of aberrations. The shells or the media may be tinted. Cf. 18,919, 1892 and 101,260.

**Pottery; bricks, etc.** M. BACCHIOLELLI and A. MEIFREE-DEVALS. Brit. 196,342, Jan. 14, 1922. Igneous rocks such as lava, basalt, dolerite, greenstone, etc., for use in pottery and making bricks and tiles, are crushed to powder and agglomerated under the influence of heat (with or without the addn. of impoverishing substances such as chamotte, quartzite, sand, etc., or fluxes) at a temp. lower than their own m. ps. The rock may be crushed to powder and porphyritized and if desired mixed with impoverishing materials and  $\text{H}_2\text{O}$  added to form a paste. It is then shaped by any known process either in the mold with or without pressure or in the lathe or by pouring in the state of slip in an absorbing mold. After being finally fashioned, it is dried and fired at the required temp. Other processes are stated.

**Fire bricks.** W. MERSE. Brit. 198,463, March 13, 1922. Fire bricks are composed of a mixt. of 1 ton of white or brown sandstone and  $7\frac{1}{2}$  cwt. of red clay. According to the Provisional Specification the proportions may be 2 parts of sandstone to 1 part of clay.

**Tunnel kiln for firing pottery and other ware.** C. F. BAILEY. U. S. 1,465,572, Aug. 21.

**Kilns for firing pottery and other ware.** C. F. BAILEY. U. S. 1,465,573, Aug. 21.

**Kiln for burning brick, etc.** E. P. STEVENS. U. S. 1,465,744, Aug. 21.

**Artificial corundum.** H. A. RICHMOND and R. MACDONALD, Jr. U. S. 1,467,590, Sept. 11. The amt. of  $\text{TiO}_2$  in artificial corundum is regulated so as to control resistance to fracture and adapt it to various grinding and polishing operations, while also providing appreciable quantities of oxides of Si and Fe in the product. The latter may comprise  $\text{Al}_2\text{O}_3$  with  $\text{TiO}_2$  over 3%,  $\text{SiO}_2$  less than 3% and Fe oxide less than 3%. Cf. C. A. 16, 2973.

**Enamels.** CHEMISCHE WERKE VORM. AUFERGES. Brit. 197,933, May 10, 1923. To prevent opaque enamel from bubbling during firing, a portion of the clay which is usually added to the mill is first made incandescent and then added to the other ingredients. One-half of the clay may be so treated, and the process is stated to be particularly applicable when Zr or Ce oxide is present.

**Glazing refractory ware.** P. TROTTER. U. S. 1,466,213, Aug. 28. Refractory articles such as saggars and ceramic "kiln furniture" are provided with a glazed coating which may be formed by ball clay, kaolin and  $\text{Al}_2\text{O}_3$  in order to prevent damage to ceramic ware from contact with the articles in the kiln.

**Refractory compositions.** R. SCHAEFER ET AL and H. SCHAEFER. Brit. 196,021, Dec. 13, 1921. Refractory compns. for making metallurgical or other furnaces by moldng are prep'd. by grinding waste siliceous bricks that have been used in furnaces or quartz that has been heated until cryst. transformation has taken place, and mixing with an organic binder. Suitable proportions are 100 parts of powder to 5 parts of binder. Binders specified are non-hygroscopic org. agglutinants sol. in  $\text{H}_2\text{O}$ , such as dextrin, amyloaceous materials, albuminoids, glucosides, glucose, gelatins, and sulfited liquors or residues; and carbonaceous materials such as resin or asphalt. The compn. is mixed with  $\text{H}_2\text{O}$ , naphtha, or other solvent of the binder, molded, and dried, and is baked *in situ* by lighting the furnace.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

**Cement.** R. W. LESLEY. *Mineral Ind.* 31, 88-97(1922).—A discussion with statistics, of production, trade, technology, and the world's markets.

**Silica cement.** E. N. McGEE. *J. Am. Ceram. Soc.* 6, 896-903(1923).  $\text{SiO}_2$  cement is usually made of about 75% ground  $\text{SiO}_2$  bricks and 25% plastic bonding clay. Some mfrs. use 50% bricks, 25% raw ganister rock and 25% plastic clay. The addn. of the ganister rock is beneficial. A little molasses added to the mixing  $\text{H}_2\text{O}$  helps bonding without reducing refractoriness.

**The influence of powdered trass and other stone dusts on the resistance of cement mortar and concrete.** OTTO GRAF. *Beton u. Eisen* 22, 185-6(1923).—Addn. of stone dust to mortars which would otherwise contain a deficiency of fine particles (cf. Graf, *Der Aufbau des Mörtels tm. Beton*, 1923) causes an increase in resistance, whereas its addn. to mortars contg. already a suitable proportion of fine particles decreases the resistance.

C. C. DAVIS

**Crude brown coal for cement works.** BERNEP. *Braunkohle* 22, 145-53(1923).—Contrary to prevailing opinion, brown coal can be used successfully and even with economic advantage for power production in cement manuf. Boiler design for brown coal firing, the advantages of firing with brown coal, results already obtained with brown coal dust in revolving furnaces, the influence of brown coal ash on cement, the drying of wet coal, the grinding of dry coal and the cost of drying are discussed with illustrations. The advantages of conversion from an anthracite to a brown coal basis depend upon the proximity and quality of the brown coal. Assuming that brown coal is dried before use but that anthracite is used directly, it is recommended that all cement works whose cost per heat unit of anthracite is more than 23-35% higher than that of brown coal should be reconstructed for firing brown coal dust.

C. C. DAVIS

**Balsam wool.** H. F. WEISS. *Chem. Met. Eng.* 29, 521-6(1923).—Balsam wool

is made from coniferous saw mill wood waste which is hogged and shredded and boiled in alk. soln. The fibers are combed apart in a beater, fireproofed, pressed until they hold 40% moisture, and subsequently dried to 10% H<sub>2</sub>O content, again shredded and combed apart. They are then blown through an atm. of cement against a traveling wire screen and cemented together so that they project in all 3 dimensions. The dried finished product is fibrous, weighs 3 lbs. per cu. ft. and has a thermal cond. of 6.1 B. t. u. in 24 hrs. per sq. ft. 1 in. thick per degree F., which is lower than that of balsa wood or cork. The material has been widely used in house construction in Minnesota and effects marked savings in the coal used for heating.

LOUIS E. WISE

**Local woods for use as marine piles.** H. W. MOOR. *Bull. Dept. Agr. Trinidad and Tobago* 20, 117-9 (1922).—Guatacere (*Lecythis idatimon*) wood contains silica crystals which are said to be present in sufficient quantity to interfere with the boring attacks of the teredo and limnoria. Used as marine piles this wood lasts about 30 years while other suitable Trinidad and Tobago woods last 5 to 15 years.

K. D. JACOB

**Fireproofing wood for theatre scenery.** ANDRE KLING AND DANIEL FLORENTIN. *Quart. Nat. Fire Protection Assoc.* 16, 260-4 (1923).—Results are given of tests on poplar and pine with various fireproofing treatments. Volatile NH<sub>4</sub> salts have low efficiency. The salts which can give real protection are those which on heating fuse to form a protective glaze. Among these NH<sub>4</sub> phosphate is most efficient. A soln. contg. 250 g. of this salt and 10 g. of gelatin or glue per l., applied to the wood surface in 2 successive coats, gives efficient protection. The addn. of powd. asbestos to such mixts. is of value only in making the coating white, so that any mech. damage to it becomes immediately apparent. The writers conclude that fireproofing of this kind can be required, with no serious inconvenience, wherever important to protect the public.

C. L. JONES

**Cements.** A. F. MUELLER. Brit. 197,702, May 15, 1923. A hydraulic cement consists of a finely divided mixt. of foundry slag with ferruginous, siliceous, and alumina-lime-, and magnesia-contg. ingredients in proportions depending upon the compn. of the slag, and with or without clinkers from furnace residues. Clinkers are preferably used which have been freed from coke, etc., by the process described in 146,238, and have thereby become coated with clay, chalk, gypsum, or carbide sludge. Suitable ferruginous addns. are bog ore, Permian limestone, brown ore, Porta stone, ferruginous sandstones, aluminous siderite, slate, ferruginous earths from Palaeozoic and Permian formations, finely divided Fe, waste sand dust and sludge from the grinding and polishing of Fe castings, and waste molding sand. Al<sub>2</sub>O<sub>3</sub> is furnished by ferruginous clay. MgO is preferably added in the form of mica sand. Suitable calcareous substances are slaked lime, lime-kiln waste, gypsum dust, and carbide sludge. Artificial stones are obtained by mixing 15 to 25 parts of the cement with 100 parts of granulated clinker, breeze, or slag, with or without other filling materials such as sand, pebbles, ground wood, etc. A small amt. of an alkali salt, such as Na<sub>2</sub>CO<sub>3</sub>, may be added to accelerate setting and increase strength.

**Cement from clay and shells.** L. E. W. PIENA. U. S. 1,465,863, Aug. 21. A submerged deposit of clay and shells in which the clay is in excess of the proportion necessary to produce cement is excavated, part of the clay is removed from the mixt. and the residue is then utilized for cement manuf.

**Portland cement and potassium compounds as by-products.** E. ANDERSON. U. S. 1,465,833, Aug. 21. A port. cement mix. contg. feldspar or other K-bearing material is clinkered by direct firing with powd. coal, after adding NaCl to the materials and the combined K is recovered from the kiln flue dust by leaching if desired. U. S. 1,465,834 relates to a similar process in which an excess of NaCl is added to the cement-forming mix, the excess being later recovered and reused with a later batch of materials.

**Cement and potassium compounds.** F. W. HUBER. U. S. 1,465,907, Aug. 21. A cement mix contg. NaCl and K-bearing material (the NaCl being in excess of combining proportions calcd. on the K present) is heated to a clinkering temp. and the flue gases are scrubbed with aq. liquid to recover K compds.

**Potassium compounds from cement mixtures.** R. D. CHEESMAN and R. C. HAFF. U. S. 1,465,841, Aug. 21. An alk. compd. such as CaO is mixed with coal and products of combustion from the burning of this mixt. are brought into contact with port. cement materials, thus producing H<sub>2</sub>O-sol. K compds. in the cement kiln flue dust which are recovered. U. S. 1,465,842 specifies a generally similar process in which NaCl is used instead of CaO.

**Plaster.** C. NOLL. U. S. 1,468,029, Sept. 18. Slaked lime 6.5 is mixed with clay

15, silica sand 73, flour 5 and cement 5 parts to form a material for plastering. Cf. *C. A.* 16, 477.

**Preserving stone, bricks, etc.** W. ANDERSON. Brit. 196,760, March 10, 1922. A compn. to be applied as a preservative to stone, brickwork, etc., consists of a mixt. of fluorides and fluosilicates of the alkali and alk. earth metals with the addn. of H<sub>2</sub>O.

**Building blocks or bricks.** E. CORDERY. U. S. 1,465,115, Aug. 14. Building blocks are formed of dried out pulverized slag, port. cement and MgCl<sub>2</sub>.

**Grouting composition for paving blocks.** J. F. McCOY. U. S. 1,465,448, Aug. 21. A grouting for block-surfaced roads is formed of lacquered sawdust or other granular fibrous material mixed with calcined magnesite, Ca(OH)<sub>2</sub>, MgCl<sub>2</sub> soln. and a soln. of shellac in Na<sub>2</sub>CO<sub>3</sub> and H<sub>2</sub>O.

**Imitating natural travertine.** J. H. DELANEY. U. S. 1,468,333, Sept. 18. An imitation of natural travertine is prep'd. by treating plastic material such as artificial building blocks contg. moisture with CaCl<sub>2</sub> embedded in the surface of the material so that it reacts with the moisture and generates gas which forms voids in the material prior to hardening and setting.

**Bituminous mixture adapted for paving.** D. A. CASEY. U. S. 1,466,928, Sept. 4. Bitumen 5.5-8.5% is mixed with 4 6% of a powd. filler, 31 41% of fine aggregate and 44.5-59.5% of coarse aggregate.

**Road-dressing materials.** J. A. VIELLE. Brit. 196,950, Nov. 8, 1921. A road-dressing or binding emulsion is formed by subjecting a mixt. of a bituminous or highly viscous oily substance and H<sub>2</sub>O to intensive mech. disintegration in an app., such as is described in 155,836 (*C. A.* 15, 1788), whose peripheral speed is not less than 1000 m. per min. The base used is preferably asphalt or hard pitch, which may be liquefied by heat or by the addn. either before or after introduction into the app., of a diluent; it is mixed with about an equal quantity of H<sub>2</sub>O. Small proportions of org. compds. containing sulfo groups, or Na or NH<sub>4</sub> oleate, or an alkali, or alkali salts of phenol may be added to accelerate the process. A small proportion of a protective colloid may be added or substituted for the same purpose. A cond. emulsion may be used as a road binder, and an emulsion diluted with oil or water, or formed from a mixt. diluted with oil, may be used as a dust-laying compn., the base being preferably of such a nature that it is not readily removed from the road by the wind. Filler substances such as china clay, cement, rubber waste, etc., may be incorporated in the mixt. to vary its properties. The emulsion may be mixed with cement or mortar to form a thick paste for use in road binding, and lime may be added before or after the addn. of the emulsion. Cf. 6018, 1905, and 185,777.

**Floor-covering mixture.** T. NAEUMURA. U. S. 1,466,241, Aug. 28. A compn. for covering floors is formed of powd. soy bean 4, Na silicate 1, NH<sub>3</sub> soln. 0.2, H<sub>2</sub>O 75, hemp, wool or cotton 10 parts and a pigment such as clay.

**Roofing material.** H. F. WEISS. U. S. 1,497,593, Sept. 11. A loose porous and highly absorbent mat of wood fibers or similar dry material with relatively slight cohesion is satd. with asphalt, pitch or similar materials of high m. p.

**Fireproof wall board.** H. A. PARKYN. U. S. 1,466,246, Aug. 28. A dried unpressed board is formed of a mixt. of difficultly ignitable fibrous material such as paper pulp or bark, a sol. silicate and asbestos.

**Wall board.** J. K. STRAW. U. S. 1,468,036, Sept. 18. Fiber board is formed of different layers one of which is composed of fibers of redwood bark while other layers are formed of other vegetable fibers, e. g., wood, flax or bagasse. The fibers of all the layers are interlaced with each other.

**Preserving wood.** R. I. SMITH. U. S. 1,467,819, Sept. 11. Wood is first soaked in a soln. of Fe sulfate and then treated with a soln. of CuSO<sub>4</sub> and tannic acid. Cf. *C. A.* 16, 2028.

**Composition for impregnating and preserving wood.** L. COIMER. U. S. 1,465,603, Aug. 21. NaF 70-90, Na dinitrophenolate 10-20 and Na phenol-sulfonate about 5 parts.

**Treating wood with acetylcellulose solution.** V. H. FORSSMANN. U. S. 1,465,937, Aug. 28. Thin layers of wood such as may be used for canoes or automobile bodies are treated with a soln. such as chrome alum and CH<sub>3</sub>O which will counteract the hygroscopic and fermentative properties of the cell contents and the wood is then impregnated with a cellulose deriv. soln., e. g., acetylcellulose and acetone.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**The work of the British Fuel Research Board.** C. H. LANDER. *Fuel* 2, 191-4 (1923). C. C. DAVIS

**The combustion of methane in the presence of glowing platinum.** J. W. WHITAKER. *Fuel* 2, 201-2 (1923).—It is advisable in analyzing gas in which the only combustible is  $\text{CH}_4$  (cf. Hansen and Nielsen, *Fuel* 2, 115 (1923); cf. *C. A.* 17, 1406) to det. the ratio  $C/A$  where  $C$  is the contraction in vol. after the 1st combustion and  $A$  the amt. of subsequent absorption in KOH. If after combustion this ratio is over 2, the combustion is incomplete and should be repeated until the ratio falls below 2.0. The ratio  $C/A$  obtained by burning  $\text{CH}_4$  by a heated Pt wire is rarely exactly 2 and tends to be less. The results for the %  $\text{CH}_4$  tend to be high compared with those from explosion analysis, whether calcd. from 0.5  $C$ , from  $A$  or from  $1/2(C + A)$ . C. C. DAVIS

**New developments in the field of motor fuels.** W. OSTWALD. *Z. angew. Chem.* 35, 278-80 (1922); cf. *C. A.* 16, 632, 816.—A brief review of work on the utilization of motor fuels. A more detailed discussion is given of a fuel known as "RKS" that contains 50 parts benzene, 25 parts tetralin, and 25 parts of 95% EtOH. E. H. LESLIE

**Several products which may be added to liquid motor fuels.** HANNS ECKART. *Brennstoff-Chem.* 4, 134-6 (1923).—A discussion is given of the action of various compds. which may be added to motor fuels to increase the velocity and to insure completeness of combustion. Naphthalene exerts a favorable action as its high vapor tension insures the rapid ignition of the fuel. Camphor has been used to some extent and owing to its O and high H content aids in the combustion.  $\text{Et}_2\text{O}$ , light benzenes and  $\text{CH}_3\text{OH}$  likewise are advantageous. In amts. up to 5% picric acid,  $\text{NH}_4$ , Me, and Et nitrate, dinitrobenzene, nitroglycerin, and dinitrocellulose have been used. N is split off and combined O is freed, which aids in the combustion of the fuel. These substances are dangerous to handle and the nitrous gases produced are detrimental to the motor. The use of pure O while it gives increased power has the disadvantage of high cost, additional wt. of container, and special cooling arrangement. The use of  $\text{KClO}_4$  and  $\text{NH}_4\text{ClO}_4$  cannot be advised because of the effect of free Cl which is liberated.

C. T. WHITE

**New technical materials for combustion engines.** H. ECKART. *Illust. Motorzg.* 1922, 384-7; *Dinglers polytech. J.* 388, 29-30.—A description, with data, of the more recent motor fuels, particularly *hydrogenated naphthalenes* (tetralin and decalin). Because of their low m. p. and high energy content (due to high d.), an important future is predicted for these fuels. C. C. DAVIS

**Benzene as a motor fuel.** A. C. FIELDNER AND G. W. JONES. *Chem. Met. Eng.* 29, 543 (1923).—Engine tests were made using crude, acid-refined, and silica-gel-refined benzenes. Air-fuel ratios used were 10.1 to 1 and 13.5 to 1 (approx.), these being calcd. from the ultimate analysis of the fuel and of the exhaust gases. Fuel consumed was measured and the C and gummy material deposited on the operating parts of the engine were removed and weighed after each run. Conclusion.—Crude benzene is not a satisfactory fuel for an internal-combustion engine because of the gummy deposits which form on the manifold and intake valves. Both kinds of refined benzenes worked satisfactorily during the 40-hr. run. Variations in air-fuel ratio showed no definite influence on the quantity of gummy deposits formed. A motor benzene which gives on evapn. a residuum less than 0.01% by wt. should be a satisfactory non-gumming engine fuel.

W. W. HODGE

**Alcohol the motor fuel of the future.** C. C. GREEN. *Chem. Age* (London) 9, 84-5 (1923).—A brief review of the properties of several composite fuels contg. alc., but mainly devoted to Natalate. This fuel is composed of 60% alc. and 40% ether. Carburetor adjustment is discussed. Fuel consumption is somewhat greater than when petrol is used. On account of the high latent heat of vaporization of alc. the air should be warm. The spark should be advanced because alc. burns slowly. C deposits are less than when petrol is used as fuel. Use of castor oil as a cylinder lubricant was found far more satisfactory than use of a mineral oil lubricant. E. H. LESLIE

**Aviation spirit, past, present and future.** A. E. DUNSTAN AND F. B. THOLE. *J. Inst. Petroleum Tech.* 9, 249-59 (1923).—A general survey of the work done to increase the motor fuel supply by changing the end-point specifications, use of substitutes for gasoline, and the use of anti-knock compds. Substitutes discussed are tetralin, cyclohexene, alc. and mixts. of these. The work of Bergius on hydrogenation of coal and

petroleum products is reviewed as is also the work of Ricardo on detonation and that of Midgley and Boyd on anti-knock compds. D. F. BROWN

**Liquids vs. solid fuels.** J. B. RATHBUN. *Petroleum Age* 12, No. 5, 48, 50, 52-3; No. 6, 46-9, 51-2(1923).—A general non-technical discussion of solid and liquid fuels and the advantages or disadvantages of each. D. P. BROWN

**Aniline as an analytical reagent in fuel chemistry.** D. HOLDE AND S. WEILL. *Brennstoff-Chem.* 4, 177-9(1923).—The use of aniline has been suggested to replace  $\text{Me}_2\text{SO}_4$  for the quant. sepn. of tar oils from mineral oils. Mineral oils are difficultly sol. in aniline, whereas tar oils dissolve readily.  $\text{Me}_2\text{SO}_4$ , on account of its poisonous properties, is more difficult to handle. Results on a number of mixt. of tar and mineral oils of known compn. are given, which prove that an excellent sepn. can be obtained with aniline. C. T. WHITE

**Fuel economy in the mining industry.** J. B. C. KERSHAW. *Fuel* 2, 222(1923); cf. *C. A.* 17, 458.—An illustrated description of economizers and air heaters, with calcns. of the heat carried off by waste gases. C. C. DAVIS

**Liquid fuels from coal a result of chemical research.** ANON. *Automotive Industries* 1923, Aug. 30, *Gas Age-Record* 52, 307-10.—A review. J. L. WILBY  
**Combustible matter in boiler ashes.** W. S. PATTERSON. *Chemistry & Industry* 42, 904-6(1923).—There are 2 sources of loss: "fusibility loss," the inclusion of C in the clinker, only a relatively small proportion of the total loss; and "mechanical loss," the presence of C in the ash, the highest loss. Ashes having the lowest softening temps. tend to show the greatest "fusibility losses." "Mechanical losses" are due to irregular and too rapid movement of the grates, inadequate aeration of the fuel bed, and the use of fuel unsuited chemically and physically to the design of the grates. From analyses of 9 samples of ash the calcd. "fusibility losses" ranged from 0.48 to 3.00% and the "mechanical losses" from 8.61 to 27.44% per 100 parts of boiler ashes. The combined losses as % of the coal ranged from 0.75 to 19.1% for 15 samples. J. L. WILEY

**Experience in Java with mixtures of bagasse and trash as fuel.** ANON. *Intern. Sugar J.* 25, 473(1923).—The advantages of this procedure, recently adopted in Java, are that the mixt. of the dry trash and bagasse burns better than the bagasse alone, and as the latter is rendered more porous by the admixt. of trash, it dries better before the grate and yields a loose ash. The difficulty has been to obtain suitable devices for cutting the trash, but one has been devised recently which promises to function efficiently. W. L. OWEN

**The heating power and efficiency of iron furnaces.** BONIN. *Gießerei-Ztg.* 10, 271-5(1923).—Expts. on several types of *house furnaces*, using coke and comparing the results by means of the temp. and compn. of the flue gases evolved, showed that the heating power and efficiency depend chiefly upon the construction of the furnace. Data on efficiency, heating power, regulation, ash, flue gases, temps., etc. are given graphically. Independently of the furnace, heating power was practically a linear function of the reduced heating surface, and the av. heat transfer value in cal/s. per hr. per sq. m.<sup>2</sup> of heating surface was 2300 at 250°, 3750 at 400° and 5000 at 550°. These values are almost independent of the efficiency at which the furnace is worked. The testing methods are described and illustrated. C. C. DAVIS

**Glance coal, distinct form of crystalline carbon.** K. A. HOFMANN AND CURR RÖCHLING. *Ber.* 56B, 2071-6(1923).—Glance coal (I) may be prep'd. by allowing some of the unburned gases from the burner to play upon a heated, glazed porcelain or a quartz crucible; porcelain crucibles with rough surfaces or iron crucibles do not give I; the limits of fortification are between 650° and 900°. The deposit of I may be obtained with dild. mixts. of illuminating gas or  $\text{H}_2$  with benzene, petr. ether,  $\text{CHCl}_3$  or  $\text{CCl}_4$  but not with  $\text{C}_6\text{H}_5\text{Cl}$  or  $\text{PhH}$ . I may be formed at temps. between 900° and 1400° provided the reaction gas is added slowly. This cryst. form of C has a high metallic luster, remains unchanged on boiling for 10 hrs. with a mixt. of concd.  $\text{H}_2\text{SO}_4$  and  $\text{HgSO}_4$  (cf. Luzi, *Ber.* 24, 4085(1891); 25, 214(1892)), a mixt. of  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  or fusion with  $\text{Na}_2\text{SO}_4$ ; analysis gave 99.08% C, 0.48% H and no ash;  $d_4$  2.07; the cond. is 6-12% that of Ceylon graphite and 12-33% that of Acheson graphite; samples prep'd. at 900°, 1100° and 1300° have the hardness of quartz, topaz and corundum, resp.; it does not possess a diamond structure but resembles more nearly that of graphite; the spectrum shows that several of the graphite lines are missing and that several of the lines of diamond appear. I serves as a binder and hardener for retort graphite, its presence being detected by X-ray optical methods and its stability in  $\text{H}_2\text{SO}_4$ - $\text{HgSO}_4$  mixt. N. A. L.

**The classification of coals.** T. J. DRAKELEY. *Fuel* 2, 195-200(1923).—An outline and discussion of the classification system recently published by D. (cf. *C. A.* 16, 1847). C. C. DAVIS

**Analyses of Illinois coals.** G. W. HAWLEY. Ill. Geol. Survey, *Bull. 27, Ext. A*, 68 pp.(1923).

E. H.

**Coal of Soochan and its importance in Pacific trade.** I. TOLMACHOFF. *Coul Age* 24, 509-14(1923).—Some analyses are included.

E. J. C.

**Coal and coke.** W. R. MORRIS. *Mineral Ind.* 31, 106-53(1922).—A review of mining and production, stocks, consumption, trade, world's output, etc.

A. B.

**Application of the flotation process to the washing of coal.** LOUIS DESSAGNE. *Technique moderne* 15, 554-60(1923).—A brief sketch of the principle of flotation, of a small lab. outfit, and of a larger com.-size app., with a rather detailed discussion of the method of operation of both, and of the field of usefulness and advantages of the process in the washing of coal. Figures are given for both lab. tests and com.-scale operations.

A. PAPINEAU-COUTURE

**The Trent process for cleaning coal.** W. A. BATLEY. *Fuel* 2, 236-41(1923).—A description with new data of the Trent process. Based on the principle involved, the attempt was made on a small scale to carry the sepn. so far that the mineral matter present in coal by infiltration could be removed and the adventitious ash thus be sepd. from that inherent in the coal. This was not practicable, but new information was obtained. Light oils and C<sub>4</sub>H<sub>10</sub> were more effective than heavy oils. Benzene was more effective than paraffin but the latter was more rapid and less was required. The org. and inorg. S compds. were unaffected, the S of the durain being unaltered. Inorg. S is the result of infiltration and deposition but the inorg. S compds., especially pyrites, are in too small amts. to be affected by the selective action of oils. They are probably adsorbed by the "amalgam" and incorporated in the nodules. This theory is supported by the fact that further grinding and the artificial addn. of pyrites retarded the elimination of mineral matter. Bituminous coals acted best when 200 mesh was used, but the process did not remove pyrites and inorg. S. Analysis of the sepd. material from the exptl. coal indicated a nearly pure kaolin.

C. C. DAVIS

**The pyridine extraction of Upper Silesian coals.** FRITZ HOFMANN AND PAUL DAMM. *Brennstoff Chem.* 4, 65-73(1923); cf. *C. A.* 16, 2397.—The investigation of the exptl. products of anthracite coal was continued with a study of the neutral oil b<sub>2</sub> 160-280°. This oil was extd. with acetone; a solid paraffin product and a sol. oil were obtained. Treatment of the sol. oil with CH<sub>3</sub>OH gave a further sepn. into sol. unsatd. hydrocarbons, and insol. satd. hydrocarbons. By treatment of the latter with acetone at 0° a paraffin product was obtained and the acetone soln. of the satd. oil. At -18° a final sepn. into paraffin compds. and satd. sol. hydrocarbons was made. The neutral oil yielded 7.0% solid paraffins, 28.0% satd. sol. hydrocarbons, and 65.0% unsatd. hydrocarbons. The following solid paraffins were identified: C<sub>21</sub>H<sub>44</sub>, b<sub>2</sub> 215°, m. 39.4°; C<sub>20</sub>H<sub>46</sub>, b<sub>2</sub> 224-5°, m. 42.9°; C<sub>23</sub>H<sub>48</sub>, b<sub>2</sub> 234-5°, m. 46.9°; C<sub>24</sub>H<sub>50</sub>, b<sub>2</sub> 242-3°, m. 50°; C<sub>23</sub>H<sub>42</sub>, b<sub>2</sub> 254°, m. 53°; C<sub>26</sub>H<sub>54</sub>, b<sub>2</sub> 262-3°, m. 55.7°; C<sub>23</sub>H<sub>46</sub>, b<sub>2</sub> 268-70°, m. 58.1°. The satd. sol. hydrocarbons consisted of C<sub>17</sub>H<sub>36</sub>, b<sub>2</sub> 151-55°; C<sub>17</sub>H<sub>28</sub>, b<sub>2</sub> 159-63°; C<sub>18</sub>H<sub>28</sub>, b<sub>2</sub> 168-72°; C<sub>15</sub>H<sub>30</sub>, b<sub>2</sub> 177-81°; C<sub>13</sub>H<sub>32</sub>, b<sub>2</sub> 186-90°; C<sub>22</sub>H<sub>34</sub>, b<sub>2</sub> 195-200°; C<sub>22</sub>H<sub>36</sub>, b<sub>2</sub> 206-10°; C<sub>22</sub>H<sub>38</sub>, b<sub>2</sub> 215-20°; C<sub>24</sub>H<sub>40</sub>, b<sub>2</sub> 225-30°. The unsaturated hydrocarbons are as follows: C<sub>13</sub>H<sub>20</sub>, b<sub>2</sub> 140-45°; C<sub>16</sub>H<sub>20</sub>, b<sub>2</sub> 150-55°; C<sub>16</sub>H<sub>22</sub>, b<sub>2</sub> 160-65°; C<sub>16</sub>H<sub>20</sub>, b<sub>2</sub> 170-75°; C<sub>17</sub>H<sub>22</sub>, b<sub>2</sub> 180-85°; C<sub>15</sub>H<sub>22</sub>, b<sub>2</sub> 190-95°; C<sub>18</sub>H<sub>22</sub>, b<sub>2</sub> 200-205°; C<sub>12</sub>H<sub>24</sub>, b<sub>2</sub> 210-15°; C<sub>21</sub>H<sub>26</sub>, b<sub>2</sub> 220-25°; C<sub>16</sub>H<sub>12</sub>, methylanthracene, m. p. 206°.

C. T. WHITE

**The anthracite problem.** HENRY BRIGGS. *Colliery Guardian* 126, 23(1923).—A description of *radiographic studies of coal*. Reliable results can be obtained in differentiating between *constitutional and extraneous ash* by this method. Thus the ash of a Braslyd coal was highly flocculent and of a clear orange color, whereas the extraneous shaly band was compact and clear white with a streak of small, sp. shaly scales of a dark drab color. Black Vein coal was transparent in the radiograph, yet contained 3.35% ash. The constitutional ashes of various coals were highly flocculent and in color were blends of lemon-yellow, orange, saffron and salmon. Two factors tend to make the total % ash of anthracite less than other coals and one tends to make it greater. The first factor is the revision of the more fissile and less compact non-anthracites by argillaceous substances, SiO<sub>2</sub> and spar, which are slowly deposited from aq. soln. and the relative immunity of anthracite from such infiltration. The second factor is the removal of part of the ash during metamorphism as a result of the formation of H<sub>2</sub>O, which by pressure and heat is a powerful enough solvent to remove both constitutional and extraneous ash, such as silicates, carbonates and sol. spar in the cleat faces. The third factor, the dispersal of volatile matter, tends to increase the ash. The theories to explain the formation of anthracite are outlined.

C. C. DAVIS

**The microstructure and banded constituents of anthracite.** C. A. SEYLER. *Fuel* 2, 217-8(1923).—The microscopic characteristics of the banded constituents of bitu-

minous coal are shown to persist even into the anthracite regions. Photomicrographs show the structure of anthracite with evidence of such constituents. C. C. DAVIS

**Powdered coal. II.** F. S. SINKATT AND L. SLATER. *Fuel* 2, 175-81(1923); cf. *C. A.* 17, 3086.—A survey of various methods for detg. the fineness of particles, indicated that the *bulk-d.* method was the only one suitable for powdered coal. A detn. of the vol. of a given wt. was found unreliable, and the most accurate method was to det. the wt. of a given vol. A cylindrical cup 0.4 in. deep and 0.3 in. diam. was filled at a fixed distance below an orifice from which the powder trickled in a thin uniform stream, and the surface was trimmed level with a razor blade. A uniform stream of powder was insured by discharging a container through a conical orifice into the receiving cup which was rotated while being filled. Since a mixt. of very fine and very coarse particles can give the same bulk-d. as a mixt. of uniform intermediate particles, it was assumed that for coal pulverized by a standardized grinding method, a regularly graded proportion of coarse and fine particles existed and that the av. size of particles was a linear function of the ratio of wt. : vol. C. C. DAVIS

**The propagation of a zone of combustion in powdered coal.** F. S. SINKATT AND L. SLATER. *Fuel* 2, 211-6(1923).—Expts. on mixts. of powdered fusain and coal showed that coal (60-90 mesh) alone does not propagate a zone of combustion, but that associated with fusain combustion proceeds throughout the mass. The technic consisted in ignition of the apex of a cone of powdered fuels, individually or mixed, combustion being characterized by a change from brown to black, followed by rapid combustion which produced a red glow. Combustion will not proceed in pulverized coal unless the particles are smaller than a definite crit. size. A study of the rate of propagation by measuring the time of combustion along a definite length of pile of powd. coal showed greatly different rates depending on the fineness of particles. Admst. of CaCO<sub>3</sub> as high as 30% did not retard the rate, nor did MnCO<sub>3</sub> or FeCO<sub>3</sub> increase it. Max. temps. of 510-85° were found during the combustion of cones of pulverized coal, and with bituminous coal 2 distinct stages occurred with a pause in the temp. rise, supporting the theory of dual combustion. C. C. DAVIS

**Pulverized coal.** A. J. GRINDLE. *Fuels and Furnaces* 1, 361-2, 364, 366(1923). The advantages of pulverized coal as an industrial fuel are given. D. F. BROWN

**Heat economy in briquet manufacture.** F. W. FOOS. *Braunkohle* 11, 327-40(1923).—A description, with a complete diagram, of the heating system of a briquet factory, with calcs. of the heat economy using brown coal. C. C. DAVIS

**A typical Belgian briquetting and ovoid plant.** J. BARBE. *Oil Eng. & Finance* 4, 200-2(1923).—A description with cuts of a modern plant designed to produce 50-60 tons of briquets per hr., according to sizes, which vary from 10 to 22 lbs. per briquet, and 20 tons of ovoids per hr., the unit wt. of which is about 1½ oz. D. F. BROWN

**The lignite industry.** J. CHANZY. *Rec. ind. minérale* 1923, 259-60; cf. *Bergwerks Ztg.* June 6, 1923.—Data pertaining to Czechoslovakia. C. C. DAVIS

**Investigations in Germany on the distillation of coal at low temperatures.** ETIENNE AUDIBERT AND ANDRÉ RAINEAU. *Rec. ind. minérale* 1923, 275-304. A review of work published in many scr. articles. C. C. DAVIS

**The practical application of flue gas analysis.** C. P. WADE. *Fuel* 2, 202-3(1923). Of the 3 methods for detg. CO<sub>2</sub>, (1) the intermittent "snap" test, (2) analysis of an av. sample over a period and (3) the continuous automatic record, the value of (2) is questioned, since no data are obtained on the cause of a low % CO<sub>2</sub> or as to whether conditions of firing are uniform or variable. (1) is useful in locating the cause of a low % CO<sub>2</sub> indicated by the automatic recorder, for by test holes at successive passes, an air leakage can be located. (3) should be used for detg. the efficiency of combustion, the presence of excess air and the % CO<sub>2</sub> per unit wt. of fuel consumed, rather than the % CO<sub>2</sub> in the waste gases. Flue gas analysis, which has been neglected in regenerative processes, reveals serious losses and great variations in the compn. of chimney gases. C. C. D.

**Water-gas plants for small gas-works.** ANON. *Gas J.* 163, 934(1923).—The plant of British Furnaces, Ltd., is described. The generator is 3 ft. in diam. and 6 ft. high with fire-brick lining, and is arranged for up-run and down-run. No special experience is required to operate the plant. An attachment has been made to the generator whereby the blue water gas is carburetted to the extent of 1 gal. per 1000 cu. ft., enriching it by 100 B. t. u. The plant is guaranteed to produce a 290 B. t. u. gas with a consumption of not more than 40 lbs. of coke and 52 lbs. of steam per 1000 cu. ft. J. J. WILBY

**Producer gas and gas-producer practice. III.** R. V. WHEELER. *Fuel* 2, 182-6, 219-21(1923); cf. *C. A.* 17, 203, 3088.—Producer construction, grates, solid-bottom, bar-bottom and H<sub>2</sub>O-bottom producers, the body of the producer, the charging hopper,

the method of providing the blast and the use of superheated blasts are described with diagrams.

C. C. DAVIS

**Proposed process for complete gasification of coal by the use of oxygen.** L. J. WILLIAMS. *Am. Gas Assoc. Monthly* 5, 565-70(1923); cf. Hodsdon and Cobb, *C. A.* 14, 2408; Jeffries, *C. A.* 15, 1204; Finlayson, *C. A.* 17, 2938.—The feasibility of such a process is still undetermined. It should be possible, using the Claude process, to produce 90% O at a cost of 50 cents or less per 1000 cu. ft. and to use this O with steam and gas coal in a producer completely gasifying the coal. It is calculated that 63,500 cu. ft. of 340 B. t. u. gas could be made per ton of coal with an expenditure of 226 cu. ft. of O and 28.5 lbs. of steam per 1000 cu. ft. of gas. Less trouble should be experienced in controlling the temp. in the producer than is at present in the control of an intermittent water-gas generator. The location, extent and temp. of the hot zone would be a function of the load placed upon the machine and the proportion of steam and O. Clinker and ash removal could probably be made continuous.

J. L. WILEY

[*Complete gasification at Stirling.*] J. M. SMITH. *Gas J.* 163, 740-3(1923).—The plant consists of horizontal retorts and a H. & G. blue water-gas plant. The retorts are built with silica segments jointed with silica clay. The thermal expansion of 1% squeezes out part of the jointing material while still green, and there being no after or permanent expansion, an absolutely gas-tight retort is ensured. The settings are also of silica material, thus avoiding retort distortion. The saving in repairs and renewals equals 33 1/4% per yr. over other types of construction. The methods of operation of the combined plant are described and operating data given. A coal gas of 581 B. t. u. and a water gas of 310 B. t. u., giving a mixed gas of 484 B. t. u. with 35.8% of water gas, are made. The make of mixed gas per ton of coal is 79.86 therm. The thermal efficiency of the water-gas plant, excluding the steam used by turbines, is 58.7%. A waste heat boiler will be provided which will raise the efficiency about 20%. There is left 8.5 cwt. of coke for sale per ton of coal carbonized. The dust from the blow period is recovered in a dust arrester as a by-product and sold for cement block manuf.

J. L. WILEY

**Progress in gas purification [at Terre Haute, Ind.].** W. S. BLAUVELT. *Gas Age-Record* 52, 334-7(1923).—The gas condensing and cleaning plant as now constituted and the functions performed by each app. are as follows: Collector mains—sprayed and flushed with weak NH<sub>3</sub> liquor, remove most of the tar and fixed NH<sub>3</sub>; condensers—multitubular water-cooled, remove much NH<sub>3</sub> and H<sub>2</sub>S, some tar and H<sub>2</sub>O; bubbling washers—fed with weak NH<sub>3</sub> liquor, remove a little NH<sub>3</sub>, tar and H<sub>2</sub>S; Smith cleaners—glass wool mat, remove 99.75% of remaining tar; primary NH<sub>3</sub> scrubber—flushed with cooled weak NH<sub>3</sub> liquor, removes most of the NH<sub>3</sub> remaining and considerable H<sub>2</sub>S; secondary NH<sub>3</sub> scrubber—fed with cold water, removes NH<sub>3</sub> completely and some H<sub>2</sub>S; primary oil scrubber—fed with partially benzolized absorbing oil, removes most of the light oil, nearly all naphthalene and much of the CS<sub>2</sub>; secondary oil scrubber—fed with cold debenzolized absorbing oil, removes nearly all of the remaining light oil, all naphthalene but a trace, and nearly all of the remaining CS<sub>2</sub>; liquid purifier—fed with soda ash soln., removes H<sub>2</sub>S to from 10 to 30 grains per 100 cu. ft. and over 90% of the HCN at a total cost of \$0.0077 per 1000 cu. ft. The plant is reliable and economical in operation, the cost of installation is relatively small and maintenance charges will be practically negligible.

J. L. WILEY

**New Saginaw River gas plant.** JAMES A. BROWN. *Gas Age-Record* 52, 332-3, 344(1923).—The plant with its auxiliary app. is described. It consists of 19 Koppers combination ovens with producer gas plant and waste-heat boiler and a Koppers liquid purifying plant.

J. L. WILEY

**Report on cooperative tests of purifying oxides.** W. A. DUNKLEY. *Gas Age-Record* 52, 371-2(1923).—Report of the Am. Gas Assoc. Chem. Sub-committee on Purification. Comparative tests made at several labs. show conclusively that certain modifications of the methods in the Gas Chemists' Hand Book applying to oxides are needed. Wide variations were found in many of the results.

J. L. WILEY

**Condensing and scrubbing fundamentals and principles.** W. H. EARL. *Gas Age-Record* 52, 399-402, 407(1923).—A report from the Am. Gas Assoc. on the detn. of the sat. temp. of gas at the inlet of the condenser as an aid in the problem of gas cooling.

J. L. WILEY

**The removal of brown coal and crude tar from distillation gases.** A. THAU. *Braunkohle* 22, 193-8(1923).—A description and discussion of cooling, washing and elec. processes for removing solid and liquid particles from retort gases.

C. C. DAVIS

**Practice and control of benzene recovery from gas. Use of solid absorbents.** REX FURNESS. *Chemistry & Industry* 42, 850-4(1923).—The practice of benzene

stripping is simplified by the use of solid absorption agents, especially those of inorg. nature as *silica gel*. They are much cheaper, equally efficient, and possess a much greater d. than active charcoal, thereby effecting a much greater "space-time" absorption. Practically a complete recovery of benzene from gas can be accomplished with comparatively little attention, const. supervision and testing are dispensed with, large vols. of circulating oil are not required, and the general operating and maintenance costs are less than in the case of absorption in washing oil. The size of plant is also considerably reduced; for a plant carbonizing 100 tons of coal per day, yielding approx. 3 gal. per ton of benzene, about 7 tons of silica gel would be required, occupying a total cubic capacity of 345 cu. ft. as against 1200 to 1800 cu. ft. of scrubber capacity with oil. Little allowance need be made for renewal or replacement of the former, whereas the latter requires more or less const. renewal. Furthermore silica gel absorption returns higher benzene figures than does oil absorption. Maintenance charges can probably be safely calcd. at  $\frac{1}{10}$  those for oil scrubbing. In practice, 3 absorption units in the form and arrangement of gas purifier boxes are charged with silica gel and the gas, freed from naphthalene, tar and, if possible, S, is passed through 2 boxes in series. After about 8 hrs. box No. 1 begins to pass over benzene and is cut out, box No. 2 then becoming the absorber with No. 3 as the safety box. In the meantime No. 1 is steamed for recovery of the benzene, and then has time to cool before resuming its place in the absorption cycle. Cooling tubes are placed in the boxes to prevent the temp. of the gel from being raised during the absorption process. A general filter with a final section containing gel should be placed before the absorption boxes. Deterioration of the absorbing gel by the deposition of tarry impurities can be almost indefinitely postponed, while in the absence of air silica gel does not effect catalytic decompr. of  $H_2S$  and deposition of free S will not occur.

J. L. WILRY

**Flow of gas in pipes.** STEPHEN LACRY. *Gas J.* 163, 119-33; *Gas World* 78, 599-610(1923).—A theoretical paper. Two types of flow are discussed: stream line flow in which the loss of pressure is directly proportional to the velocity; turbulent flow in which the loss of pressure is approx. proportional to the square of the velocity. L. explains how the crit. velocity varies directly with the viscosity of the fluid and inversely with its d. and the diam. of the pipe and gives the crit. velocities and corresponding discharges in cu. ft. per hr. for pipes of  $\frac{1}{4}$  to 1 in. bore for water, air and town gas. Equations are developed for both types of flow, and the value of the coeff. of friction is detd. in the high pressure formula when applied to high velocities.

J. L. WILRY

**Concentration of ammonia liquor.** A. S. NISBET. *Gas J.* 163, 747-81(1923).—Crude liquor of 3.75 to 4% Tw. contg. 1.44%  $NH_3$  is brought up to 22° or 23° liquor contg. 16%  $NH_3$ . The plant is of a familiar type. Trouble was experienced from corrosion by the CN compds. of the cast-Fe preheater and coil. This was remedied somewhat by installing one of tubular boiler design with a coil of antimoniated Pb. A sample of concd. liquor contained by wt. 1.56%  $(NH_4)_2S$ , 35.8%  $(NH_4)_2CO_3$ , 3.65%  $NH_4CNS$ , 3.92%  $(NH_4)_2SiO_4$ . The cost of plant and its operation is less than that of a sulfate plant.

J. L. WILRY

**Back run gas.** W. W. KLYCE. *Gas Age-Record* 52, 331-2; *Am. Gas J.* 119, 262-4(1923).—Back run gas is made on an ordinary water gas set so modified that steam is introduced into the gas take-off at the superheater, passing back through the superheater and carburetor in a superheated condition to the generator, where, combining with C, it forms blue gas which is led to the wash box and thence to the relief holder. Three cycles are used: blow, up-run and back-run. All oil is introduced on the up-run, the back-run being started as soon as the oil is cut off and the machine clear of oil gas. The back-run time is about 50% of the total run period. By this method the checker bricks are kept free from C, a considerable saving in generator fuel is realized, and a 540 B. t. u. gas is made with a decreased consumption of coke and oil and an increased capacity per run. Soft coal has been used successfully as water-gas fuel. The process is covered by U. S. pat. 1,468,190 (see below).

J. L. WILRY

**Products yielded by carbonization of coal at low temperatures.** II. J. D. DAVIS. *Fuels and Furnaces* 1, 336-8(1923); cf. C. A. 17, 3240.—Low-temp. coke will probably not replace high-temp. coke in its legitimate field, but gives favorable promise for domestic uses. From 2 to 3 times as much tar is produced by low-temp. carbonization and its compn. is much different. It contains much tar acids and little or no phenol as such nor naphthalene nor anthracene. The light oils are characterized by naphthenes or hydrogenated aromatic compds. The yield of gas and  $NH_3$  is much less than with high-temp. carbonization.

D. F. BROWN

**New carbonization plant at Battle Creek.** C. S. HOLT. *Gas Age-Record* 52, 337-8(1923).—The problem was to find a method whereby the fluctuating industrial

and seasonal demands for gas could be met without an overproduction of coke and by-products and still operate the carbonization plant at a const. rate. This has been solved by adapting the by-product coke oven to gas plant purposes with the manuf. of a good quality of gas of 550 B. t. u. and a coke suitable for any use, and obtaining the tar and  $\text{NH}_3$  yields of by-product practice, and being able to operate with ideal flexibility by substituting oven gas for producer gas in varying proportions for heating purposes, and, if necessary, a diln. of the oven gas with producer gas, and finally steaming the coke previous to discharge for additional gas with little reduction in calorific value. The plant consists of 11 Koppers ovens.

J. L. WILEY

**Mixing coals for carbonization.** J. D. DAVIS. *Gas Age-Record* 52, 373-5(1923).—A review of the recent attempts made to show the technical practicability of blending coals or mixing inert carbonaceous material with binders to produce coke. In view of our present supply of good coking coal, it does not seem necessary to undertake the industrial development of synthetic coke.

J. L. WILEY

**A new apparatus for distillation analysis.** WÖHLING. *Braunkohlen- u. Brikett-industrie* 1922, 1418-9; *Dinglers polytech. J.* 338, 30-1.—The Al app. of Fischer for distn. detns. has certain inherent faults which are overcome in a new type of app. devised by W. It consists of a vertical porcelain tube mounted on an elec. oven controlled by an elec. pyrometer. A short glass tube connected with the porcelain tube leads the tar vapors to a condenser. For technical work, the app. should be made to distil 50 g. of coal per hr. For research, a tube of 300-400 g. capacity is used with a series of receivers for detg.  $\text{NH}_3$ ,  $\text{H}_2\text{S}$ ,  $\text{CO}_2$  and combustible gases. In this case the distn. lasts 4 hrs.

C. C. DAVIS

**Remarks on the paper of Franz Fischer: "Primary coal tar and the products of its superheating."** FRANZ SCHÜTZ, WILHELM BUSCHMANN AND HEINRICH WISSEBACH. *Ber.* 56B, 1091-6(1923); cf. *F.*, *C. A.* 17, 1883.—The temp. 500-600° given by the authors in their 1st paper referred to the temp. in the heating chamber beneath the rotating drum; within the drum it never exceeded 480°, as detd. by introducing pieces of pure  $\text{PbCl}_2$  (m. 475-80°) in Fe capsules. They agree with F. and others that 400-500° is a sufficiently high temp. for the formation of the tar but do not agree that benzine distils off at 300°. The yields depend greatly on the nature of the coal; from their First Hardenberg cannel coal the authors obtained by complete carbonization up to 500° 90 kg. tar and 50 cu. m. gas per ton. The light oils they have investigated thus far are only that (tar benzenes) which is obtained by dehydrating the tar, of these the fraction b. up to 75° consists chiefly of unsatd. hydrocarbons, with a much smaller amt. of satd. hydrocarbons, together with O- and S-contg. substances (chiefly acetone). The oils b. above 75° consist chiefly of aromatic hydrocarbons, a smaller amt. of unsatd. hydrocarbons and relatively little paraffins; no cyclohexane could be detected. The presence of  $\text{C}_6\text{H}_6$ , PhMe and xylenes was established, as was also that of carbolic acid in the phenol fractions. No explanation can as yet be given of the formation of  $\text{C}_6\text{H}_6$ .

C. A. R.

**Low-temperature tar from Prince Hardenberg coal, with special reference to the benzene, phenol and acetone content.** HANS BROCHE. *Ber.* 56B, 1787-91(1923).—B. discusses the results of F. Schütz (*C. A.* 17, 1321, 2774 and preceding abstract) and F. Fischer (*C. A.* 14, 1431, 1433, 2070, 2071, 2072, 2073, 2074) in which the former found aromatic hydrocarbons of importance in low-temp. tar whereas the latter observed none. B. distd. 42 and 47 kg. of Prince Hardenberg coal and detd. quant. the amts. of  $\text{C}_6\text{H}_6$ , PhOH, and acetone present. Thick tar was collected at 130° and light oil at 15°. The gas was washed with water for the acetone, then passed through charcoal for gas benzene. 44.5 cu. m. of gas per ton was obtained. The principal amt. of gas and tar was given off between 400° and 450°. The 70-90° benzene fraction had a  $d_{40}^{\circ}$  of 0.7127, which is too low for aromatic hydrocarbons. The presence of  $\text{C}_6\text{H}_6$  and its homologs was established, but in such small amts. that they do not influence the character of the benzene. PhOH was present in the 180-190° fraction to the extent of 30%, with none in the 190-195° fraction. Based on the total tar, B. finds 0.04%  $\text{C}_6\text{H}_6$  and 0.16% PhOH; and not more than 50 g. of acetone per ton of coal.

C. B. EDWARDS

**The relations between low- and high-temperature coal tars and petroleum, with remarks on the contributions of F. Schütz and H. Broche.** FRANZ FISCHER. *Ber.* 56B, 1791-4(1923); cf. two preceding abstracts.—The points of likeness between low-temp. tar and crude petroleum are: optical activity; abundance of H; sp. gr.; high-boiling portions are paraffins (not anthracene, etc.); the content of  $\text{C}_6\text{H}_6$ , phenol and acetone is low; and  $\text{C}_{10}\text{H}_8$  is present in small amts.

C. B. EDWARDS

**The determination of alkali-soluble constituents (phenols) present in small amounts of coal tar.** P. K. BREUER AND HANS BROCHE. *Brennstoff-Chem.* 4, 122-4(1923).—

The estn. of tar acid content of the small amt. of tar from the Fischer and Schrader A1 test retort was very difficult. B. and B. worked out the following method, accurate to 1% of the total tar treated: Water is first dstd. by distn. at 100° with 10 cc. of xylene. The residue is then repeatedly extd. with ether, and tar acids are removed from the ether soln. with 2.5 N NaOH. After evapg. the ether, the neutral oils are returned to the distn. flask and again heated to 100° with 5-7 cc. xylene. The amt. of tar acids present is given by loss in wt. due to extn. with alkali. Appropriate corrections are applied for tar acids volatile in the water dtn., and for the amt. of tar insol. in alkali and ether.

C. T. WHITE

**Researches on vertical retort tars.** I. **Phenolic constituents.** G. S. CURRY. *J. Soc. Chem. Ind.* **42**, 379-387 (1923).—The investigation discloses that the reason for the coloration of the river water by the waste discharge from the Mortlake Gas Works, Australia, is the presence of polyhydroic phenols (principally catechol) in the vertical-retort NH<sub>3</sub> liquor. Details of the exptl. work performed are given. The probable compns. of vertical-retort tars is: monohydroic phenols (series C<sub>n</sub>H<sub>2n-6</sub>(OH)<sub>1</sub>); phenol, cresols, xylenols, trimethylphenols, tetramethylphenols, naphthol homologs, hydro-naphthols, phenols of hydroanthraeic and of other high boiling hydrocarbons; polyhydroic phenols (series C<sub>n</sub>H<sub>2n-6</sub>(OH)<sub>2</sub> and C<sub>n</sub>H<sub>2n-6</sub>(OH)<sub>3</sub>); catechol, resorcinol, pyrogallol, and a methyl ether, possibly guaiacol. The approx. quant. compn. % by vol. basis of phenols and water-free tar, resp., is as follows: phenol 4 and 0.6; cresols 23 and 3.45; xylenols 22 and 3.3; higher phenol homologs and polycyclic phenols 50 and 7.5; polyhydroic phenols (mainly catechol) 1 and 0.15. The colored emulsions obtained when disinfectants made from vertical-retort tar oils are added to water are due to the presence of catechol in these oils. Disinfectants producing pure white emulsions can be obtained by carefully fractionating vertical-retort tar distillates and rejecting all oils boiling above 230°.

J. L. WILKINSON

**The occurrence of ketones in primary-tar oil.** R. WEISSGERBER. *Brennstoff-Chem.* **4**, 51-2 (1923).—The object of this study was to det. whether the ketone found in the fraction of primary-tar oil b. about 200° is the same as that (acetophenone) found previously in coke-oven tar oil (cf. *Ber.* **36**, 754 (1903); Schulze, *Ber.* **20**, 411 (1887)). The fraction of primary-tar oil b. 190-200° (2.5 l.) was heated on the water bath with 70 g. PNaHNH<sub>2</sub> for 30 min. and allowed to stand 24 hrs. The product was dried over K<sub>2</sub>CO<sub>3</sub> and dstd. *in vacuo* up to 150°. The residue was treated with dil. HCl and dstd. in steam, yielding 44 g. crude ketone. Purified twice through its hydrazone, it is a colorless liquid with pleasant, fruity odor, distg. almost completely at 190.5°. The phenylhydrazone is a viscous, yellowish oil distg. undecomposed *in vacuo* at about 202°; *p*-nitrophenylhydrazone, yellow leaves, m. 83.4°. Analysis agrees fairly well with that calcd. for octanone. Oxidation of 9 g. of the ketone with 37 g. KMnO<sub>4</sub> gave 4 g. unchanged ketone, 3 g. carboxylic acids (mostly liquid), much AcOH, some higher fatty acids b. under 200°, a small amt. of BzOH and a very small amt. of (CH<sub>3</sub>CO)<sub>2</sub>O. It is evident that there is present an aliphatic ketone or ketones differing from that of coke-oven tar oil. The presence of BzOH and (CH<sub>3</sub>CO)<sub>2</sub>O in the oxidation products indicates a small amt. of hydrogenated, or partially hydrogenated, acetophenone.

C. T. WHITE

**Chemical composition of lignite tars.** J. K. PFAFF AND A. KREUTZER. *Z. angew. Chem.* **36**, 487-9 (1923).—Lignite benzene, d<sub>25</sub> 0.800, was fractionated between 02° and 148°. In addn. to C<sub>6</sub>H<sub>6</sub> toluene and m-xylene, the presence of thiophene homologs was proved (C. A. **15**, 2872). The 111.5-112.5 fraction was condensed with CH<sub>3</sub>COCl and P<sub>2</sub>O<sub>5</sub> for the prep. of 2-acetyl-5-methylthiophene. This was purified as the phenylhydrazone, m. 127°, and as the oxime, m. 125°. The thiotoluene content of this oil fraction is at least 3%, or 25% of the total S compds. present. The ketone content of lignite benzene fractions 140-160°, 160-180°, and 180-200°, was investigated by the method of Weissgerber (cf. preceding abstr.). The ketones have aliphatic structure. Individual members were not isolated. The quant. dtn. of the ketones by the Kauller-Smith method (*Chem. News* **93**, 83 (1906)) showed 2.2% in the 100-220° light oil fraction, 3.3% in the 180-320° fraction and 4.5% in the 240-400° fraction.

C. B. E.

**The measure and determination of the combustibility of coke.** F. HAUSSER. *Grückschrift* **59**, 699-702 (1923).—No method has heretofore been known for dtn. the combustibility of coke, though numerous attempts have been made to develop a satisfactory method (cf. Simmersbach, *Grundlagen der Kokk-Chemie*, 2nd Ed., 211; Stahl u. Eisen **1886**, 71; **1923**, 33, 298, 431, 1178; C. A. **16**, 2299, 2588, 2975; Kruppseke Monatshefte Apr. 1923, 57). A method is developed for estg. the combustibility from the compn. and temp. of the gases of combustion. The combustibility is a function of the reactions: (1) C + O<sub>2</sub> → CO<sub>2</sub> and (2) CO<sub>2</sub> + C → 2CO and the greater the sum of the rates of

these reactions, the higher the combustibility. This sum cannot be detd. directly and the combustibility must be measured indirectly by analyzing the gas (at a point in the combustion zone where reactions (1) and (2) occur) for  $\text{CO}_2$ , CO and O and the abs. temp. In this case  $(\text{CO}_2 + \text{CO})/\text{O}_2$  is a max. for a completely combustible coke and the value of this ratio actually found compared with this max. at the particular temp. gives a measure of the combustibility. The ratio  $[(\text{CO}_2 + \text{CO})/\text{O}_2]_{\text{detd.}}/[(\text{CO}_2 + \text{CO})/\text{O}_2]_{\text{max.}}$  gives the combustibility on a % basis. Complete mathematical derivation of the values of  $[(\text{CO}_2 + \text{CO})/\text{O}_2]_{\text{max.}}$  for the temp. range 700-1200° is given. The values are as follows: 700°, 1.76; 750°, 1.88; 800°, 1.95; 850°, 1.98; 900°, 1.98; 950°, 1.99; 1000°, 1.99; 1100°, 1.99; 1200°, 2.00. The procedure recommended is to burn the samples of coke with the same (1) size of particle, (2) shaft oven and (3) air supply, and to det. at the same cross-section the av.  $\text{CO}_2$ , CO and temp. From this the value of  $(\text{CO} + \text{CO}_2)/[100 - (\text{CO} + \text{CO}_2)]/(21/79)$  is calcd., which, divided by the value of  $[(\text{CO} + \text{CO}_2)/\text{O}_2]_{\text{max.}}$  for the temp. detd., gives the combustibility. This method assumes that the gases of combustion contain no free O.

C. C. D.

**A new apparatus for the coking test of coal.** R. LESSING. *Fuel* 2, 152-5, 186-90 (1923).—The standard test of Lessing (cf. *C. A.* 6, 2996, 3008; 14, 1888; *J. Gas Lighting* 118, 815, 855 (1912); *Trans. Inst. Gas Eng.* 1912, 242) is described and illustrated with exact details of manipulation.

C. C. DAVIS

**A new process for the purification of gases and vapors (STACH).** 13. Crude brown coal for cement works (BERNER) 20. Progress in ore dressing and coal washing in 1922 (RICHARDS, LOCKE) 9. Cold, clean, artificial gas in glass making (BLAKE) 19. Rare gases in natural gas (MOUREU) 2. Sydney coal field, Nova Scotia. Great Bras d'Or Coal District, Cape Breton (HAYES, BELL) 8. Briquetting (Brit. pat. 197,433) 9. Gaseous fuels; internal-combustion engines (Brit. pat. 197,647) 18. Treating sugar cane (Brit. pat. 196,224) 28. Continuously operating still with inclined distilling columns (U. S. pat. 1,466,221) 1. Retorts (for coal) (Brit. pat. 198,063) 1. Recovery of flotation oils (Brit. pat. 198,346) 9.

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**Fuel.** W. S. SMITH. Brit. 195,719, Dec. 31, 1921. Ground or pulverized oil shales such as the Kimmridge shales are mixed with binding materials such as coal tar, pitch, resin, petroleum residues, waste starch, sulfite cellulose liquids, etc., and the mixts. compressed into briquets, ovoids, eggs and lumps or blocks of any suitable shape. Coal dust, anthracite duff, crushed coal, coke, straw, sawdust, chalk, clay and household refuse, such as tea leaves, fats, bones, papers, etc., may be added to the mixt. before compressing, and the briquets, etc., may be rendered waterproof by immersion in hot pitch, glue, water glass, etc.

**Fuel mixture.** A. L. RAVEN. U. S. 1,466,480, Aug. 28. A kindling compn. is formed of burnt sienna 3, ashes 3 and sawdust 2 parts mixed with sufficient coal oil and coal tar to form a paste or putty-like mass.

**Liquid fuel.** GENERAL MOTORS RESEARCH CORPORATION. Brit. 196,237, June 23, 1922. Metal compds., preferably the sol. alkyl or phenyl compds. of Pb, are mixed with gasoline, kerosene, or other liquid hydrocarbon to increase the compression that may be used in the cylinder of an internal-combustion engine before knocking is produced. As an example 1 vol. of tetraethyl Pb was dissolved in 339 vols. of gasoline: the crit. compression value was raised from 75 to 160 lb. per sq. in. Other compds. specified are the methyl, isopropyl, and the triethyl hydroxide and other ethyl compds. of Pb, Pb acetate or oleate, and the alkyl and phenyl compds. of Se, Te, Sn, As, Sb, or other metals in Groups 4, 5 and 6 of Mendelyeef's table.

**Concentrating fuels.** T. RIGBY. Brit. 197,357, Jan. 4, 1922. Solid fuels such as coal, lignite, peat, etc., are concd. to obtain the different grades in the forms best suited for their respective uses. The coal is ground, graded by a wet process such as froth-flotation or in an upward-current classifier, and the different portions are separately dried in drying tubes by currents of hot gas carrying the material in suspension. The greater portion of the coal is obtained in such a form that it contains only a little non-combustible ingredient and is suitable, without further grinding, for treatment in coking ovens for the production of metallurgical coke. The low-grade residue obtained is further ground, before or after drying, for use in powd. fuel burners. The drying app. is preferably of the type described in 182,157, the hot gas currents being derived from any suitable source. To prevent deposition of the fuel, especially coal, in the dry-

ing tubes, stirring devices such as spiral conveyors may extend along the bottom of the tubes or the hot drying gases may enter the bottom of the tubes in the form of sep. jets or streams. Alternatively the material to be dried may be introduced into the drying tubes by a no. of sep. inlets, or baffles may be inserted in the tubes to cause eddies in the gas current and so break up and redisperse the dust coned, towards the center of the tubes Cf. 429, 1912 (C. A., 7, 2141) and 175,004.

**Agglomerating fuel, etc.** H. DU BOISTESSELIN, O. DUBOIS, F. W. TABB, L. VARNIER and L. HERTENBEIN. Brit. 197,639, Dec. 6, 1922. In agglomerating powd. material, particularly fuel dust, by means of pitch, a pseudo soln. of pitch and water, e. g., in equal quantities, is mixed with the material and the mixt. pressed and dried, preferably at a temp. of 200–250°, which ensures the removal by evolved steam of volatile products of the pitch. In one method, pitch is ground with water as the dispersing agent. Small amts. of gummy or resinous substances, such as dextrin, resin soaps or coned, exts. of sulfite cellulose, may be added to the water, and oxidizing agents such as chloride of lime or nitrates of metals having two degrees of oxidation such as Fe, Cr, Co, etc., may be introduced into the pseudo soln. before it is mixed with the fuel dust in order to oxidize oils contained in the pitch and promote the combustion of the fuel.

**Fuel briquets.** SOC. DITE L'AVENIR. Brit. 197,901, June 29, 1922. Anthracite, coke, etc., in powder form is mixed with the pulverized mass obtained by coning. In sulfite lye after complete neutralization of  $H_2SO_4$  (free or in part combined), contained therein. Water is added if the fuel material is not sufficiently humid to form a plastic mixt. The fuel is compressed into briquets which are baked up to about 200° for 20 to 40 min. In an example 100 parts of material are mixed with 3 to 3½ parts of solidified lixivium.

**Incorporating "anti-knock" substances with motor fuel.** F. E. ASELTINE. U. S. 1,467,222, Sept. 4. An "anti-knock" substance such as  $PhNH_2$  or EU is fed into a fuel mixt. at the high compression employed by the engine in which the mixt. is used. The amt. of "anti-knock" substance supplied is regulated by the fluid pressure differentials produced in the operation of the engine.

**Molded products from coal ashes.** S. Bo. U. S. 1,466,083, Aug. 28. Solid articles are molded from a mixt. of cement, lime and alum or other binder with coal ashes which are substantially free from coke and sol. salts, previously treated with  $H_2O$ , lime and herring brine and then with water glass soln.

**Apparatus for homogenizing air and liquid hydrocarbon fuels for combustion.** H. S. LAMB. U. S. 1,463,797, Sept. 4.

**Carburetors.** A. E. BACHELOR. Brit. 196,313, Oct. 24, 1921. A combustible gas for use in connection with a lamp is produced by passing O through a mixt. of liquid hydrocarbons of different sp. grs. which have been rendered hydrons of which contain aq. vapor or other compd. contg. H. To prep. the hydrated mixt., steam is passed into a gal. of liquid hydrocarbon of sp. gr. 0.800; the free water is eliminated and the liquid is mixed with 1 gal. of a lighter hydrocarbon having a sp. gr. of 0.680 and 2 gals. of another hydrocarbon of sp. gr. 0.720, the resulting mixt. having a sp. gr. of about 0.740 to 0.715. Further details are given.

**Gas manufacture.** T. M. DAVIDSON and R. H. S. ABBOTT. Brit. 195,711, Dec. 29, 1921. In the carbonization of coal a central gas and vapor outlet tube is arranged extending into the retort and the charge is fed forward within the retort in the space between the retort wall and the gas outlet tube so that it is compressed while in a plastic condition and a hard and dense coke is obtained. A suitable construction is specified.

**City gas from oil.** E. L. HALL. U. S. 1,466,648, Aug. 28. Oil gas is fixed at a temp. adapted to produce rich gas and thin tar. Another portion of oil gas is fixed at a temp. of 1000° or higher to produce lean gas and lampblack and the 2 gases are then blended in proportions to make an av. gas between 500 and 600 B. t. u. per cu. ft.

**Generator gas production.** J. VAJK. U. S. 1,467,460, Sept. 11. In production of highly heated generator gases, the openings of the generator are closed except for an exit opening below the zone of incandescence and an upper exit opening is opened upon every new charge for a period to permit the discharge of  $H_2O$  vapor and initial gasification products. The pressure within the generator is gradually increased and the upper exit is closed when the quantity of initial gaseous products decreases and the temp. increases.

**Producing gas.** F. T. SNYDER. U. S. 1,467,957, Sept. 11. One portion of a mass of carbonaceous fuel is subjected to the action of gas and steam to generate additional gas and another portion of the same mass of fuel is subjected to the distg. action of the produced gas to produce other gas. Some of the gas produced is simultaneously burned

and the heat thus generated is utilized for heating the gas to which the portion first mentioned is subjected.

**Gas producers.** **SOC. ANON. DE CONSTRUCTION DE FOURS à COKE SIMPLEX.** Brit. 196,509, April 6, 1923. In a gas producer of the kind in which the ash is fused and run off, an intensive and continuous gasification with the max. output of light tars is obtained by blowing in steam heated to 900–1000° and air heated to 600–900° in superimposed planes, the steam being delivered through tuyères and the air through other tuyères. A perforated feed cylinder which may be interchanged with others of different heights serves to vary the height of the fuel above the tuyères and to allow volatiles to escape from the fresh fuel into the gases leaving the producer. Minerals such as limestone, flux, iron ore and combustibles such as coke waste or shale may be added. Tap holes for slag and iron resulting from the charge are provided. The slag produced is suitable for the manuf. of cement.

**Gas producer.** **D. J. SMITH.** U. S. 1,467,955, Sept. 11. A steam boiler is heated by the producer furnace, a steam engine is mounted upon the producer and supplied with steam by the boiler and the engine is utilized to drive the moving parts of the producer.

**Gas producer.** **H. HERNU.** U. S. 1,466,831, Sept. 4. A generator comprises a furnace zone, a reaction zone, a furnace with a dished fire-grate in it and a vertically movable guard surrounding the grate to retain the fuel.

**Gas scrubber.** **H. G. JOHNSTON.** U. S. 1,465,397, Aug. 21.

**Apparatus for proportional mixing of gases.** **W. B. EDDISON.** U. S. 1,466,356, Aug. 28. The app. is adapted for mixing fuel gas, and air for combustion.

**Hydrogen; gas producers.** **J. H. WEST, A. JAGUSS and C. B. TULLY.** Brit. 195,798, Jan. 19, 1922. H and gases rich in H are prep'd. by the complete gasification of bituminous coal in an "intermittent mixed gas generator" such as is described in 192,743 and by causing the resulting gases to undergo catalytic conversions with steam into CO<sub>2</sub> and H without intermediate cooling. An intermittent mixed gas generator is defined as a generator having a lower fuel chamber or producer, above which is arranged a retort with a heating jacket, the fuel being carbonized in the retort, and descending into the producer where it is blown alternately with air and steam, the former being to provide the necessary heat to carry out the steam reaction and for the preliminary carbonization. The arrangements are such that the hydrocarbons given off by the coal are completely cracked by the heat of the lower fuel bed into H and C and the latter reacts with steam as in the ordinary water-gas reaction. A suitable construction is specified.

**Illuminating gas.** **D. J. YOUNG.** U. S. 1,468,190, Sept. 18. In making carbureted water gas, the gas making run is varied by passing steam through the entire app. at intervals and simultaneously adding fuel directly to the generator. This manner of operation serves to facilitate gas-making from lignite and similar fuels.

**Ammium sulfate.** **PEASE & PARTNERS, LTD., AND G. STEPHENSON.** Brit. 197,724, Feb. 13, 1922. Gases contg. NH<sub>3</sub>, such as coke-oven gases, are used to neutralize crude (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> by arranging the neutralizing vessel either in the main conveying the gas from the producer, or in a by-pass to the main, the residual gases from the neutralization being then led on to the saturators, scrubbers, or other by-product recovery plants. Steam may be introduced into the neutralizing vessel.

**Cooling coke.** **H. SCHWENKE.** U. S. 1,467,506, Sept. 11. Inert gases are passed cyclically through different masses of coke successively and heat is extd. from the gases between the time of contact with the hottest coke and contact with cooler coke by using the gases to heat boilers or ovens.

**Coke oven construction.** **E. LECOCQ.** U. S. 1,466,663, Sept. 4.

**Tower for dry cooling of hot coke.** **A. MOETTELI.** U. S. 1,466,477, Aug. 28.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Terms used in the petroleum industry. ANON. *Petroleum Times* 10, 312(1923).—A brief explanation of some of the more common terms used in the industry.

D. F. BROWN

Petroleum and natural gas. D. T. DAY. *Mineral Ind.* 31, 499–552(1922).—

Data are given on markets, trade, and the world's production, conditions in the various fields are discussed, and the world's oil shale deposits are considered A. B.

**Louisiana-Arkansas crude and refined oil.** C. E. BOWERS. *Oil & Gas J.* 22, No. 14, 20-21(1923).—Production, refinery and pipe line statistics for 1920-22 with map showing routes of pipe lines. D. F. BROWN

**The oil in natural gas of Refugio County, Texas.** L. A. THIELE. *Chem. Age (N. Y.)* 31, 415-6(1923).—A wet gas (0.5 gal. per M cu. ft.), in contradistinction to the dry gases of neighboring counties, has been found, one well flowing at a rate of 157.5 million cu. ft. per day. The rock pressure is 1680 lbs. per sq. in. W. F. FARAGHER

**Petroleum in the Philippines.** ANON. *Petroleum Times* 10, 328(1923).—A brief description of various occurrences of oil on the islands. The oil is a paraffin base and resembles closely those from Burma and Borneo. A sample from Tayabas had a sp. gr. of 0.8325 and yielded 39% gasoline, 41.5% kerosene, 10.5% heavy oil and no S. Pidatin oil had a sp. gr. of 0.9297, gave no gasoline, 45% kerosene, 49.5% heavy oil and 5% residue. The natural bitumen from Billaba has a sp. gr. of 1.05, hardness 2, is jet black with a brilliant luster and breaks with a conchoidal fracture. Production of bitumen in 1920 was 2000 tons and in 1919, 1500 tons. D. F. BROWN

**The Argentine and its petroleum possibilities.** ANON. *Petroleum Times* 10, 239-40(1923). D. F. B.

**Researches on Italian petroleums.** MASSIMO PENOGLIO. *Ann. chim. applicata* 13, 80-96(1923).—Extensive data are given on the occurrence, geology and phys. and chem. properties of 4 more Italian petroleums (cf. *C. A.* 17, 2016) from (1) Neviano dei Rossi (Parma); (2) Rivarazzano (Pavia); (3) Ripi (Roma) and (4) S. Giovanni Incarico (Caserta). (1) arises from deposits of sand intercalated in argillaceous schists of the Eocene epoch, is rich in benzine and is valuable as a motor fuel. (2) is limited in amt. and occurs in Miocene clays. (3) and (4) are analogous geologically and occur in Miocene deposits of limestone as intercalations in argillaceous and sandy schists. Certain peculiar characteristics are best shown by the following data which give the color, odor, appearance,  $d_4^{20}$ ,  $d_{40}^{20}$ , coeff. of expansion (0-15°), b. p., flash point (Pensky), fire point (Pensky), sp. heat, calorific power, viscosity (20° Engler),  $n_D^{15}$ , rotatory power ( $D$ ), % total S, % by wt. distg. below 150°, % distg. 150-270° and % distg. 270-355°: (1) straw yellow, pleasant, bluish fluorescence, 0.7676, 0.755, 0.0010, 26°, -2°, 0.5°, 0.50, 10,902, 0.924, 0.417, +0.05 (10°), 0.08, 75.5, 24.4, 1.0, (2) reddish yellow, pleasant bluish fluorescence, 0.920, 0.910, 0.00069, 178°, 79°, 92°, 0.37, 10,700, 1,792, 1,488, +0.9 (10°), 0.20, 0, 44.7, 46.0, (3) black, disagreeable, green fluorescence, 0.922, 0.912, 0.00074, 70°, 45°, 60°, 0.14, 10,513, 2,452, 1,593 (13°), —, 3.17, 2.3, 27.9, 56.6, (4) black, disagreeable, opaque, 1.003, 0.994, 0.00063, 175°, 113°, 148°, 0.43, 10,150, 22,23, 1,656 (13°), —, 3.90, 0, 19.1, 9.0. Data are also given for the individual distn. fractions. No H<sub>2</sub>S is present in any petroleum and all have a neutral reaction. C. C. D.

**Heavy-grade Egyptian crude petroleum.** W. A. GUTHRIE. *J. Inst. Petroleum Tech.* 9, 212-47(1923).—A heavy crude petroleum is found at Burghada at about 1600-2000 ft. depth. At present production here averages 3500 tons per wk. A portion of the field is "wet," i.e., contains about 30% of salt water in the form of refractory brine emulsion. Elec. dehydration has proved successful in breaking this emulsion. The oil is a mixed base, has a pleasant odor, and has a S content of about 2%. It has a calorific value of nearly 19,000 B. t. u. per lb. and contains traces of V and Ni. Ordinary commercial distn. gave 6-8% of gasoline, b. below 150°, 14-15% of kerosene, b. between 150° and 290°, and 76% of residue above 290°. The gasoline and kerosene fractions may be refined to first-class products. The residue was worked up to give 43.2% of Solar or Diesel oil and 29.3% of hard pitch calc'd. on the crude. A representative sample of the pitch had sp. gr. 1.038, penetration at 77° F. (100 g. for 5 sec.) 78, ductility at 77° F. (Dow) over 100, flowing point (Kovac's) 50° C., bitumen sol. in CS<sub>2</sub> 99.75%, bitumen sol. in CCl<sub>4</sub> 99.5%, maltenes (sol. in pentane) 70.1%, asphaltenes, 29.65%, free C and ash 0.25%, paraffin wax (pentane method) m. 104° F., 10.59°, paraffin wax (distn. method) m. 105° F., 5.27%, S 2.89%. The malthene ext. was of a sticky cementitious nature. Air reduced the ductility of the finished bitumen to 50 cm. and the penetration to 38. Use of Egyptian pitches in road building is discussed. Cracking the heavy residue and rerunning the distillate gave the following fractions (the figures show % yield on the residue and sp. gr., resp.): light petroleum spirit 4.5, 0.71%; heavy petroleum spirit 2.7, 0.768; kerosene distillate 16.5, 0.820; heavy distillate 20.2, 0.858; Diesel fuel oil 25.6, 0.890; coke 23.1; loss (gas) 7.4. To investigate the paraffin content of the oil, it was distd. down to coke, the gasoline sep'd. and the remainder of the distillate collected together. This had a sp. gr. of 0.878 at 15.5° and amounted to 76.5%

of the total. After sepn. from the water it was treated with 3% of  $H_2SO_4$  (d. 1.84), for 1 hr. at a temp. just high enough to keep it liquid, settled and the acid tar run off. The tar-free oil was then caustic-treated and redistd. with steam, the distillate being cut at the point where paraffin sepd. from a drop placed on a beaker contg. ice. This gave the following fractions, for which % yield,  $d_{15}^{25}$ , and flash point in degree F. are given: gasoline 8, 0.731, —; kerosene 15, 0.822, 108; solar oil 24.3, 0.860, 170; unfinished lubricating oil 23.0, 0.924, 356; crude paraffin scale 6.0, —, —; coke 12.2, —, —; loss 11.5. The characteristics of the crude oils from Jemsa and Abu Durba are briefly described.

D. F. BROWN

**The photochemical properties of Kalujskja petroleum (Maikop).** B. G. TYCININ. *Nepht. Slantz. Khoz.* 4 (1) 73; *J. Inst. Petroleum Tech.* 9, 207A (1923).—On extg. solid asphalt from this crude by Holde's method, the soln. in petroleum ether, free from asphalt, continued to deposit lake-like films on standing exposed to the light. The deposition of asphalt ceased in the dark. Presence of large surface solids (fine Ni wire or glass wool) increased the amt. of deposit. The phenomenon is explained by the fact that the pre-formed asphalt is contained in the petroleum as a colloidal soln. and can be coagulated by the action of light, heat or solvents. The formation of natural asphalt is explained in this way. It is suggested that Holde's method be modified as follows: (1) the pptn. of asphalt to be always made in the dark, (2) solids such as glass wool to be introduced to secure quick and complete pptn.

D. F. B.

**Some methods of analysis of oil shales and sapropelites.** M. F. STRUNNIKOV. *Nepht. Slantz. Khoz.* 4 (2) 276; *J. Inst. Petroleum Tech.* 9, 224A (1923).—Hygroscopic and general moisture are detd. in a desiccator or in a drying oven at 90° with a powdered sample. The shale is perceptibly oxidized at 100–105°, but at 90° this is much less. During drying the shale loses water and  $CO_2$  and absorbs O from the air. Drying is stopped when the wt. remains const. or begins to increase. Volatile matter is detd. by Muck's method with a 0.5-g. sample. The Pt crucible must be 4–5 cm. high. N content is detd. by the methods of Kjeldahl and Dumas. S is detd. by the Eschka method, with a 0.5-g. sample in case the volatile matter is large. A definite relation is observed between sp. gr. of shales from the same deposit and their volatile content. Sp. gr. is detd. by the Chatelier-Kandlo app., water, turpentine or gasoline being used as liquid. All of the methods are applicable to sapropelites, but moisture is more quickly detd. in an evacuated desiccator than in a drying oven, both methods giving equal results.

D. F. BROWN

**Organic matter of Colorado oil shales.** A. J. FRANKS AND B. D. GOODIER. *Oil Eng. & Finance* 4, 175–7, 257–61 (1923).—A discussion of the theories of origin of oil shales is given in an attempt to explain the nature of kerogen. The work of other investigators is reviewed. Kerogen consists of the oil-forming and coke-forming constituents. About 8% of the former is sol. in  $CS_2$ . The remainder can be decomposed to a series of heavy bitumens from which the crude oil is obtained by destructive distn. The coke-forming constituents decompose simultaneously to form fixed C and gas. Primary decompn. occurs not at a definite temp. but within a wide range of temps. All primary products are formed at 300–350° without producing any oil. The rate of decompn. is much greater at the higher temps. Primary decompn. resembles cracking and is not a polymerization. Bitumens produced at different temps. are not of the same compn. The oil-forming part of the kerogen is a complex mixt.

D. F. BROWN

**Oil shales of Colorado and Indiana compared.** D. E. WINCHESTER. *Railroad Red Book* 40, 823–8 (1923).—Known data concerning shales found in these two regions tend to show that the Colo. shales far surpass the Ind. shales because of their much greater thickness and richness and their greater availability for the manuf. of shale oil and  $(NH_4)_2SO_4$  at a low cost.

D. F. BROWN

**Coorongite: a member of the petroleum family.** ANON. *Petroleum World* 20, 384; *Petroleum Times* 10, 300–11 (1923).—This substance occurs in the Coorong basin (Australia) and is similar to the "paraffin dirt" of the Texas and Louisiana oil fields. In the cool state it gives free petroleum. It yields 22 gal. of motor spirit, 82 gallons of illuminating and lubricating oil, 65 gal. heavy vaseline oil, and 44 gal. tar per ton. It is claimed to have been produced by petroleum seepages and indicates large underground deposits of oil.

D. F. BROWN

**Gasoline from natural gas.** G. A. BURRELL. *Chem. Met. Eng.* 29, 544–5 (1923).—The absorption of gases by silica-gel and activated charcoal is discussed briefly. The equipment and operation of an activated charcoal plant for the recovery of gasoline from natural gas is described. Photos and diagrams are given. Cf. *C. A.* 17, 1134.

W W H

**Use of lime in petroleum refining.** BENJ. T. BROOKS. *Rock Products* 27, No. 18, 35-6(1923).—Ca(ClO)<sub>2</sub> is made for refining naphtha or pressure distillate, by circulating milk of lime and Cl with a centrifugal pump through a concrete tank. The Cl is introduced into the suction line of the pump through an expansion coil suspended on the wall of the tank. A pump rated at 600 gal. per min. will effect the soln. of 1 ton of Cl in 2.5 hrs. A diagram is given. W. F. PARAGHER

**Muel cracking process.** ANON. *Oil & Gas J.* 22, No. 14, 42, 91-2(1923).

D. F. BROWN

**Preparation of petroleum from vegetable oils.** A. MAILHÉ. *Compt. rend.* 177, 202-4(1923); cf. *C. A.* 16, 3304; 17, 197. The work described involves chiefly colza oil, with 10% ZnCl<sub>2</sub> as condensing agent. After heating the mixt. for some time and distg., products resembling American petroleum were obtained. Further treatment with ZnCl<sub>2</sub> of the higher boiling fractions leads to lubricating oils of still higher b. p., and finally to waxy solids. BEN H. NICOLET

**Oil-field waste.** A. B. THOMPSON. *J. Inst. Petroleum Tech.* 9, 311-20(1923).—Waste or commercially avoidable losses are divided into (1) ground waste; incomplete recovery, unrestricted relief of gas pressure, flooding by water, and emulsions; (2) surface waste: fuel, eruptive wells, evapn., settlement, drainage, and soakage, gas and gas-gasoline losses; (3) waste of energy, labor and material: waste drilling waste of plant, material and labor. Loss due to incomplete recovery is estd. at 50-90% of the oil penetrating the exploitable area. The methods used to overcome these losses are enumerated and discussed. D. F. BROWN

**How color reduces the evaporation of oil.** W. T. DRACON. *Oil News* 11, No. 17, 13-4(1923).—Storage tanks should be painted in light colors. Tests with different colored paints are described. D. F. BROWN

**Highly volatile natural gasoline good refinery refrigerant.** L. D. WYANT. *Nat. Petroleum News* 15, No. 40, 99-107(1923).—Three types of volatile gasoline were used in a paraffin chilling equipment. The gasolines used were (1) natural gas gasoline as commercially made (85° A. P. I.), (2) natural gas gasoline from high stage compressors (90° A. P. I.), (3) high gravity gasoline (93.1° A. P. I.) obtained by compressing the uncondensed still vapors of a low pressure absorption gasoline plant. The least satisfactory of these was No. 1 and the most satisfactory No. 3. A badly worn compressor was used and hence a fairly high loss of gasoline was noted. However, the danger of explosion is very slight if proper ventilation is provided. Had the same amount of NH<sub>3</sub> leaked out the air would have been so contaminated that no one could have worked near the installation. 120 lbs. pressure was in general the most efficient pressure used. It is concluded that the use of volatile gasoline is feasible and practicable for the purposes investigated and that the expansion temps. of -22° to -36° F. attainable are low enough to extend the uses of this refrigerating medium over a wide range. D. F. B.

**The hydrogenation of hydrocarbon oils.** H. C. SHATWELL. *Fuel* 2, 229-32 (1923).—An historical review. C. C. DAVIS

**The behavior of naphthalenes in the catalytic dehydrogenation process.** A contribution to the explanation of the nature of crude petroleum. N. ZELINSKI. *Ber.* 56B, 1718-23(1923).—Octanaphthene, from an old sample prep'd. from Caucasian crude petroleum, was passed through a tube contg. Pt black at a temp. of 300-10°. Very little H was liberated, and the change in  $n_{D^2}$  was only from 1.4170 to 1.4177. After a second passage through the tube at a rate of 10 drops per min., the value of  $n_{D^2}$  was 1.4197, while after the third passage, no more H was formed, and  $n_{D^2}$  had become 1.4183. The product was shaken three times with fuming H<sub>2</sub>SO<sub>4</sub> (10% SO<sub>4</sub>). After washing and drying, the product was distd. over Na, practically all passing over at 118.5-119.5, the b. p. range of the original material. The value of  $n_{D^2}$  had become 1.4157. From the analysis of the product, it was evident that some paraffin hydrocarbon was present in the original fraction (15-20%). Isooctanaphthene was similarly little affected by the action of Pt black. This behavior and the similarity in the consts. indicate that both contain the same ring unit. Nonanaphthene (b. 136-137.5°, corrected) was likewise practically unaffected when passed over Pd black. Paraffin compds. were present in this product, also. 1,4-Dimethyl-2-ethylcyclopentane dissolves somewhat in fuming H<sub>2</sub>SO<sub>4</sub> (10% SO<sub>4</sub>), the acid becoming dark. However, little heat is liberated and no SO<sub>2</sub> is evolved. This behavior is the reverse of that shown by derivs. of cyclohexane. The nonanaphthene used was, by this test, shown to be without a 6-carbon ring. Not only the naphthalenes prep'd. from naphthenic acids, but also those sep'd. from the low-boiling fractions of petroleum are cyclic compds., but not hydroaromatic compds. W. F. F.

**Decahydronaphthalene and its behavior during the catalytic dehydrogenation**

**process.** N. ZELINSKII. *Ber.* 56B, 1723-4(1923).—Naphthalene was completely hydrogenated by passing tetrahydronaphthalene and H<sub>2</sub> over platinized asbestos at 150-160°. The same reactions take place at 120° with Pd black. The product b. 189-90° (corrected). Other properties are as follows: d<sub>4</sub> = 0.8804 and n<sub>D</sub><sup>20</sup> = 1.4744. When passed over Pd black at 300°, naphthalene was regenerated readily. No unsatd. product was obtained, showing that all 10 H atoms split off simultaneously. This behavior is further evidence of the equivalence of the two rings of naphthalene. W. F. F.

**Higher alcohols from petroleum olefins.** W. W. CLOUGH AND CARL O. JOHNS. *Ind. Eng. Chem.* 15, 1030-2(1923).—From the olefins formed during the pyrolytic distil. of petroleum fractions, isopropyl, secondary butyl, amyl, hexyl, heptyl and octyl alcohols are being prep'd. on a commercial scale by the Standard Oil Co. of New Jersey. The chemical and physical properties of these ales. and of some of their derivs. are given. Isopropyl ale. and *isopropyl acetate* form an *azeotropic soln.*, which b. 80.1°. The C. by wt. of alc. in the soln. is 52.3. Another such soln. is formed by secondary butyl alc. and H<sub>2</sub>O. The soln. b. 87.5°, and contains 72.7% alc. by wt. This alc. and its acetate form an azeotropic soln., b.<sub>18</sub> 99.60°, and contg. 86.3% of alc. by wt. W. F. F.

**Properties of lubricating oils.** J. B. RATHBUN. *Petroleum Age* 12, No. 6, 55 (1923).—A compilation of the important properties and sources of the animal oils, Red oil, stearin, tallow, tallow oil, lard, and lard oils D. F. BROWN

**Commercial lubricating oils.** J. LÉVY. *Technique moderne* 15, 522-30(1923).—Discussion of the general properties required of liquid lubricants, with a description of the various animal, vegetable and mineral oils used and of their properties. A. P.-C.

**Nature of lubrication in engineering practice.** T. E. STANTON. *J. Inst. Petroleum Tech.* 9, 260-73(1923).—Expts. were carried out with a pair of cylindrical lubricated surfaces in the form of a rocking shaft and its bearing, the oscillating motion being produced by attaching to the shaft a heavy pendulum swinging by gravity. It is shown that the lubrication of all machine details in which the relative motion is of a reciprocating character may be taken as boundary lubrication and hence the use of fatty acids in this kind of lubrication will effect an improvement in the efficiency. With steady relative motion, however, it would be possible by the use of a suitable lubricant and correctly proportioned surfaces to set up a condition of film lubrication of the Reynolds type with all the advantages which this system affords. With reciprocating motion a liberal amt. of grooving to give the oil access to all parts of the bearing surface is necessary for efficient boundary lubrication. D. F. BROWN

**Lubricants for internal-combustion engines.** BERTIL KNUTSON. *Teknisk Tidskrift* 53, Kemi, 49-51(1923).—A brief discussion of the requirements of automobile lubricants followed by procedure for examg. such. Seven tests are made: C residue (see U. S. Bur. of Standards, *Tech. Bull.* 323); sedimentation, detg. solids formed by heating an oil at 200° for 10 hrs.; viscosity; flash point; sp. gr.; free acid; temp. at which it becomes rigid on cooling. The sedimentation test is a modification of Ger., Eng. and Am. standard methods: Use an oil bath with oil having a flash point of 330°. Place cylinders contg. 20 g. sample in the bath. Heat for 10 hrs. to such a degree (225°) that the sample is kept const. at 200°. Cool the sample and transfer to a 300 cc. flask. Rinse with 200 cc. benzene. Let stand overnight and filter through alundum crucible using a little pressure. Wash with 200 cc. benzene. Dry 10 min. at 100°. Break up residue with a glass rod and wash with 100 cc. benzene. Dry 15 min. and weigh. Results of the examn. of 20 oils are tabulated. A. R. ROSE

**Discussion of automobile oils.** A. C. CARPENTER. *Nat. Petroleum News* 15, No. 37, 18(1923).—Correct lubrication is much more a matter of correct viscosity than of high fire test. It is necessary to compound Penna. oil with cylinder stocks to get an oil heavier than 200 viscosity. Okla. oils up to 300 viscosity can be obtained without compounding while the viscosity of Texas oils can run up to 1000 without addition of cylinder stocks. The advantages of these kinds of oils are discussed as well as the use of light and heavy oils in motors. D. F. BROWN

**Steam turbines and their lubrication.** F. A. HOFF. *Oil News* 11, No. 17, 15 (1923).—A general discussion of the properties which turbine oils should have. D. F. BROWN

**Deterioration of turbine oils in use.** ALEX. DUCKHAM AND S. E. BOWREY. *Engineering* 116, 353(1923).—The importance of the chem. character of the constituents of a crude oil in the production of turbine oils which are resistant to oxidation under service conditions, is emphasized. W. F. FARAGHER

**Determination of small amounts of moisture in transformer oils.** A. PHILIPP. *Bayerischen Industrie u. Gewerbeblatt* 1922; *Riv. chim. ind.* 32, 226(1923).—Heat 100

cc. of the oil to 100° on an oil bath, and pass a current of dry air under 208–762 mm. of Hg through the oil and through a series of tared U-tubes immersed in freezing mixt. at –20°. After 2–3 hrs. dry the U-tubes and weigh. P. claims to det. as little as 0.017–0.006 g. of H<sub>2</sub>O per 100 cc. of oil.

A. PAPINEAU-COUTURE

**Technical specifications for transformer and switch oils.** ANON. *Petroleum Z.* 19, 838–49 (1923).—Specifications and tests for these oils as described by the Vereinigung der Elektrizitätswerke, E. V., are given in full and discussed.

D. F. BROWN

**Asphalt.** PRÉVOST HUBBARD. *Mineral Ind.* 31, 63–9 (1922).—A review of the industry, with statistics.

A. B.

**The solid bitumens of Leyte.** B. NELSON. *Philippine J. Sci.* 22, 617–30 (1923).—Natural solid bitumens occur in Leyte Province in two forms: pure bitumen, and bitumen-impregnated rocks. The pure bitumen is of little industrial importance because of the limited quantity available. It is brownish in color, hard and brittle, and of conchoidal fracture, m. p. 61.5°, sp. gr. at 25° 0.978, ductility 0, penetration 2 deg., sol. in ethyl acetate 81.5 to 90.5%, volatile matter at 265° 1.15%, and fixed carbon 8.76 to 9.99%. The material is apparently largely paraffin hydrocarbons. The bitumen-impregnated rock is commercially important because it can be used for road building. The rock contains 10 to 11% of bitumen. This bitumen is quite different from the natural bitumen in its properties. It is viscous, soft, and semi-fluid. Fixed carbon is 11.0%. The inorganic material associated with the bitumen is largely CaCO<sub>3</sub>.

E. H. LESLIE

**The bituminous limestones of Syria considered as a source of hydrocarbons.** VERRIER. *Chimie et industrie Special No.*, 420–2 (May, 1923).—See *C. A.* 17, 3096.

A. PAPINEAU-COUTURE

**Chemistry of wood. VI. Results of analysis of heartwood and sapwood of some American woods.** G. J. RITTER AND L. C. PLACK. *Ind. Eng. Chem.* 15, 1055–6 (1923); cf. *C. A.* 16, 4337.—In soft woods, the water, ether and alk. exts. are higher in the heartwood than in the sapwood. The cellulose and the lignin (except the lignin of white cedar) are correspondingly lower in heartwood. Hard woods may be divided into 2 classes: (a) those with high extractives in the heartwood and high cellulose in the sapwood, (b) those with high extractives in the sapwood and high cellulose content in the heartwood. AcOH by hydrolysis is highest in the sapwood in both the hard woods and the conifers.

LOUIS E. WISE

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Balsam wool (Weiss) 20. Distilling column elements (STREPPENS) 13. Retorts (for oils) (Brit. pat. 198,063) 1.

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**Cracking hydrocarbons.** D. W. HOVEY. Brit. 197,372, Feb. 6, 1922. In treating crude petroleum, gas oil, fuel oil, residues, etc., to obtain light distillates, the oil is heated in a still under a pressure of 25–75 lbs. per sq. in. by superheated steam or other heating agent passed through coils immersed in the oil, and is agitated by injection of superheated steam or of heated gas or vapor such as H<sub>2</sub>, natural gas, or the gas obtained in the distn. of petroleum. A suitable construction is specified.

**Cracking hydrocarbons.** S. L. GARTLAN and A. E. GOODERHAM. Brit. 197,494, April 4, 1922. Hydrocarbon oils are vaporized at or about atm. pressure so as to produce little decompos., and the vapors are cracked by being subjected to a high pressure (up to about 100 atm.) and are allowed to expand either to atm. pressure or to 25–125 lbs. per sq. in. A suitable construction is specified. Cf. *C. A.* 16, 3388.

**Cracking hydrocarbons.** S. L. GARTLAN and A. E. GOODERHAM. Brit. 197,495, April 4, 1922. The app. constituting the invention is identical with that described in 197,494 (above). Cf. 179,645.

**Cracking hydrocarbon oils.** D. T. DAY. U. S. 1,467,758, Sept. 11. Tars and heavy oils are cracked so as to avoid C deposition within the app. employed by adding the oil to be treated to a mass of oil-bearing shale to form a dry non-caking mixt., continuously introducing this mixt. into a retort where it is subjected to a cracking temp. and thus utilizing the shale as a scouring medium as the material is continuously passed through the retort (which may be a horizontal tube with a screw-form conveyor). Oils of low b. p. evolved are condensed.

**Cracking hydrocarbon oils.** B. VAN STEENBERGER. Brit. 198,071, Feb. 27, 1922. In cracking heavy oils to produce gasoline, the preheated oil is sprayed into a chamber contg. electrically heated surfaces which may be coated with catalytic material. H<sub>2</sub>O

may be sprayed with the oil and H may be supplied to the chamber. A suitable construction is specified.

**Hydrocarbon oil from shale.** D. T. DAY. U. S. 1,467,757, Sept. 11. Fresh shale in a closed chamber outside of a furnace is subjected to the action of hot shale distn. gases and vapors which constitute the sole means of heating the chamber, to effect preliminary distn. and the partially distd. material is then allowed to descend into a retort still within a furnace beneath the chamber referred to. Gases from this retort serve to heat the first distn. chamber.

**Distilling hydrocarbon oils.** E. H. FRENCH. Brit. 196,306, Oct. 17, 1921. See U. S. 1,394,488 (*C. A.* 16, 488).

**Treating hydrocarbon mixtures.** J. H. C. DE BREY. U. S. 1,465,598, Aug. 21. Mixts. such as casinghead or still gases which contain a valuable liquid and a worthless gaseous material are rectified at a relatively low temp. under a superatm. pressure below 20 atm. to expel the worthless component while condensing a portion of the latter in the last fraction to avoid loss of the valuable liquid which it carries. U. S. 1,465,599 specifies a similar process except that the rectification is carried out under pressures above 20 atms.

**Refining petroleum.** P. T. SHARPLES. Brit. 197,389, Feb. 9, 1922. See U. S. 1,416,890 (*C. A.* 16, 2599).

**Distilling petroleum, etc.** BRÜNN-KÖNIGSFELDER MASCHINENFABRIK DER MASCHINEN UND WAGGONBAU-FABRIKS AKT.-GES. VORM. H. D. SCHMID AND K. FUCHS. Brit. 196,624, April 21, 1923. The liquid is distributed over the surface of a horizontal heating member from the lower part of which it drops on to a second horizontal heating member. The liquid, preheated in a tank, is distributed by a perforated pipe or the upper tube of a coil through which superheated steam, hot water, or other heating agent is passed. The liquid drops on to the second tube of the coil and so on. The unevapd. liquid may be passed in succession through a series of similar evaporators, the vapors being withdrawn separately through outlets. Superheated steam may be passed into the evaporators through a pipe. The heating agent may be passed through the coil in a direction the same as or contrary to the flow of oil over the outer surface.

**Separating constituents of petroleum emulsions.** W. S. BARNICKEL. U. S. 1,467,831, Sept. 11. Rocky oil or bottom settlings are treated with a sulfo fatty acid to liberate globules of H<sub>2</sub>O present and the materials are allowed to stratify.

**Gasoline production from heavier oils.** R. YATES. U. S. 1,465,752, Aug. 21. Oils such as petroleum material of high b. p. are decomposed in both liquid and gaseous phase in cylinders within each of which there is a rotating drum. Oil and vapor enter the drum under vapor pressure, the vapors fill the drum and expel the oil into an annular space between the drum and cylinder. Oil is circulated around the annular space to prevent overheating and is subjected to a moderate decomposing temp. in contact with the heating surface of the cylinder. Vapors within the drum are subjected to the same temp. and after time to permit decompr., the vapor pressure is reduced to effect regulated fractional sepn. of components of different b. p.s.

**Desulfurizing oils.** A. C. NESFIELD. Brit. 196,680, Jan. 25, 1922. Mineral oils are desulfurized by impregnating them with HCl gas and air, or a mixt. of HCl gas, H, and air, washing the treated oil with NaOH or lime water, and filtering by centrifuge or otherwise to remove the S, etc. The oil may be treated in gaseous form, or may be exposed to the gases as a film or spray, or the gases may be bubbled through it. Crude shale oil or spirit may be distd. into two fractions terminating at about 392° F. and 750° F., each fraction being separately treated. To obtain white spirit, the oils, after washing with alkali, may be further washed with 2% of H<sub>2</sub>SO<sub>4</sub>; if emulsification occurs, the oil is washed with NaCl soln. The process may be carried out in the app. described in 183,527 (*C. A.* 17, 206) or that specified herein.

**Resolving emulsions.** H. A. GILL. Brit. 195,876, April 25, 1922. Water-in-oil emulsions are resolved by agitation with a non-metal colloid adapted to coalesce the H<sub>2</sub>O followed by settling or centrifuging. Suitable colloids specified are glue, gelatin, albumin, casein, gum arabic, and gum tragacanth, and a convenient quantity is 0.1% dissolved in a little H<sub>2</sub>O. Emulsions specified are that of crude petroleum contaminated with H<sub>2</sub>O, and that produced by washing with water petroleum refined by acid treatment.

**Distilling shale.** UNITED KINGDOM OIL CO., LTD., G. F. FOREWOOD AND J. G. TAPLEY. Brit. 197,069, Feb. 16, 1922. Addn. to 128,255 (*C. A.* 13, 3007). Relates to the process described in the principal patent, for the combined distn. of shale and cracking and hydrogenation of the oil vapors, in which shale is supplied to a vertical retort heated at the top to about 400° and at the bottom to about 600° and supplied with

**steam** and the vapors are drawn from near the bottom of the retort. According to the invention, the gases from the condenser are freed from  $H_2S$  and preferably also from  $CO_2$  and are returned to the retort. Steam is supplied at various parts of the retort including the outlet, and in various directions. Cf. 145,198 (*C. A.* 14, 3153) and 190,284 (*C. A.* 17, 3097).

**Apparatus for extracting oil from shale.** J. MAYES and R. HOMRIGHOUSE. U. S. 1,465,277, Aug. 21. Molten Pb in a horizontal receptacle is used to heat shale and vaporize oil from it in a superposed receptacle through which material is passed from one end to the other by agitating and drag paddles.

**Apparatus for distilling oil from shale.** J. ZANDER. U. S. 1,468,335, Sept. 18. Shale or similar material to be treated in the still is introduced and residue is removed from the still through liquid-seals. The still comprises floor sections arranged one above another.

**Gas and water separator for oil wells.** L. L. CARTER. U. S. 1,468,193, Sept. 18. **Pipe system for saving gas and oil from producing wells.** E. A. STARKE. U. S. 1,467,512, Sept. 11.

**Electrical apparatus for dehydrating petroleum oils.** R. E. LAND. U. S. 1,467,003, Sept. 4.

**Furnace for cracking or distilling straw or other vegetable materials.** F. PFEIFER. U. S. 1,466,511, Aug. 28.

**Apparatus for heating oil from wells (to facilitate separation of water).** G. C. KELLEY. U. S. 1,465,398, Aug. 21.

**Apparatus for electrically treating petroleum emulsions.** H. C. EDY. U. S. 1,466,208, Aug. 28. The app. comprises a rotating electrode within a closed tank.

**Lubricating oil.** J. B. SOUTHCOMBE and H. M. WELLS. U. S. 1,467,605, Sept. 11. Crude hydrocarbon oils are refined by acid treatment to remove impurities but to leave, after washing out inorg. acid, a finished oil contg. a material amt. of org. acid, somewhat less than 2% but sufficient to reduce the frictional coeff. of the oil substantially. This serves to improve the lubricating effect of the oil. Cf. *C. A.* 16, 305.

**Lubricant.** H. KURATA. U. S. 1,466,022, Aug. 28. A mixt. adapted for lubricating marine or other engines is formed of mineral oil 50,  $H_2O$  350, soy bean albumin 40, phenolic preservatives 2 and  $Na_2CO_3$  4 parts.

**Bituminous compositions.** A. C. DE CAUDEMBERG. Brit. 198,136, March 24, 1922. Rubber is incorporated with asphalt, bitumen, pitch, etc., by means of liquids of high b. p. which are solvents for rubber and bitumen. Suitable solvents are mixts. of  $C_6H_5Cl_4$  with benzine or toluene contg. 20% of  $C_6H_5Cl_4$  for cold preps. and 85% for hot ones. An asphalt compn. to be compressed cold is obtained by mixing in the cold 100 parts of powd. asphalt with 3-4 parts of a soln. contg. 2.5-5% of rubber. An asphalt to be used in a fused condition is made by melting together 100 parts of asphalt, 5 parts of bitumen, and 4-5 parts of a soln. contg. 5-7.5% of rubber, with or without the addn. of sand or gravel. A bituminous concrete is obtained by adding 15-20 parts of rubber soln. to 100 parts of melted bitumen and mixing this compn. with a mineral aggregate or pouring it upon a layer of aggregate *in situ*.

**Colored artificial asphaltum.** D. SANGUINETTI. U. S. 1,465,317, Aug. 21. See Brit. 181,092 (*C. A.* 16, 3548).

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

**Bibliography of periodical publications on paper making and allied subjects during 1922.** ANON. *Bull. Tech. Sect. Papermaker's Assoc. Gl. Britain & Ireland*, Aug. 1923, 37 pp.

**International paper and pulp statistics.** K. G. HAGSTROM. *Svensk Pappers Tid.* 26, 280-1, 343-5 (1923); cf. *C. A.* 17, 2361.—Pulp and paper statistics from January to June 1923 including Sweden, Norway, Finland, United States, Canada and other countries. W. SEGERBLOM

**Paper and pulp industry at the Gottenburg exposition.** ANON. *Svensk Pappers Tid.* 26, 295-9 (1923).—Descriptive and statistical. W. SEGERBLOM

**The economical recovery of old papers.** FRITZ HOYER. *Z. Ver. deut. Ing.* 67, 637-9, 663-5 (1923).—Methods for treatment of old papers are described, including dusting and cutting machinery, sorting devices, magnetic contrivances for removing metal, shredders and disintegrators, soaking and screening drums, etc. W. H. S.

**The viscosity of some cellulose acetate solutions.** E. W. J. MARDLES. *J. Chem. Soc.* 123, 1951-7 (1923).—Viscosities of concns. of cellulose acetate in acetone, cyclohexanone, triacetin and benzyl alc. were detd. with a falling-sphere viscometer. No relation between viscosity and concn. was found. Decreasing temp. increases viscosity. Depending on the temp. there is a max. concn. of cellulose acetate in solvent above which gelation occurs.

WALTER H. SWANSON

**Determination of viscosity of cellulose.** ANON. *Chem. Age (London)* 8, 222-4 (1923).—In the detn. of viscosity of cellulose in cuprammonium hydroxide soln. variations will occur unless large-scale samples, finely divided, are used. Cuprammonium hydroxide should be made by dissolving 11 g. pure Cu per l. of carbonate-free NH<sub>4</sub>OH. It should be kept in dark bottles. In the detn. of viscosity enough cellulose to make a 2% soln. is placed in a specially constructed dark bottle, which is then successively evacuated and filled with H until all air is removed. The required amt. of cuprammonium hydroxide is then added. After shaking, and allowing the sample to stand for 2 days the viscosity of the soln. is detd. by a falling-sphere viscometer.

WALTER H. SWANSON

**Can the heat supplied to upright boilers be better utilized than at present?** B. HAAS. *Chem.-Ztg.* 45, 1035-7 (1921).—A discussion of the relative economy of varying ratios of height to width and of the construction of the heating coil of upright boilers used in the *cellulose industry*. Expts. indicated that boilers of the relative dimensions 5:6.4 and 3.6:5.55 were more economical thermally than the 4:10 and 3:8 ratios ordinarily used. More economy was obtained with the usual type of 4:10 or 3:8 boiler with the heating coil not too near the walls of the boiler.

C. C. DAVIS

**The lignin content of spruce.** P. KLAJON. *Svensk Pappers Tid.* 26, 319-22 (1923).—According to v. Euler (*C. A.* 17, 2049) the % lignin in spruce as detd. by K. should be raised 3%. K. reports the compn. of spruce as: cellulose (free from pentosan) 53%, hemicellulose 15%, lignin 30%, fats, proteins, resins, etc., 2%. Lignin contains acetyl complexes amounting to 2% of the dry wt. of the wood. K. discusses the priority of the H<sub>2</sub>SO<sub>4</sub> method and describes it in detail. A high concn. of H<sub>2</sub>SO<sub>4</sub> requires very thorough washing of the ptd. lignin. Best results are obtained with 61-68% acid. Lignin detd. by the H<sub>2</sub>SO<sub>4</sub> method is 28%, agreeing closely with Hagglund's result by the HCl method. Lignin, free from ash, contains C 63.97, H 5.32, and pentosan 1.70%. An 80-yr.-old spruce gave 29.5% lignin (5 detns.) while a 100-yr.-old spruce gave 26.6% (6 detns.). v. Euler calcd. the lignin content on wood extd. with alc.-C<sub>6</sub>H<sub>6</sub>. K. calcd. it on wood dried at 98°, the fat and resin being sep'd. with the lignin. Wood contains less H<sub>2</sub>O at 98° if the resin has been extd. than if present. For example pine lignin gave 5.8% resin when extd. with alc. and pine wood 5.7% when extd. directly with petroleum ether and then Et<sub>2</sub>O. When 5.8 g. of pine were heated with alc. in a closed vessel for 4 days at 98°, 8.2% fat and resin was obtained. Alc. resin gives a strong lignin reaction and compares with the lignin in ligninsulfonic acid. It consists of about equal parts carbohydrates and lignin, detd. by dissolving the fat and resin from the alc. resin with C<sub>6</sub>H<sub>6</sub>, treating the residue with HCl and Fehling soln., and detg. the % C (63.8) in the HCl-insol. portion. K. discusses the probable explanations for action of alc. on dry wood; also possible errors in v. Euler's selection of wood disks. W. S.

**Cellulose.** A. R. DE VAINS. Brit. 197,329, April 30, 1923. Pulp obtained by treating cellulosic materials with Cl is treated with alk. or alk.-earth bases or with alk.-earth salts of acids weaker than HCl, these reagents being added in aq. soln., in suspension in a suitable liquid, or in the solid state. The HCl resulting from the chlorination is thus neutralized and the chlorinated org. products are dissolved. Cf. 19,099, 1913, (*C. A.* 9, 377), 189,561 (*C. A.* 17, 2504), and 198,975.

**Cellulose acetates; filaments; films.** J. O. ZDANOWICH. Brit. 196,641, Nov. 22, 1921. See U. S. 1,457,131 (*C. A.* 17, 2505).

**Alkali cellulose for etherification.** E. S. FARROW, JR. U. S. 1,467,107, Sept. 4. Alkali cellulose is prep'd. for etherification by mixing cellulose with an aq. soln. contg. more alkali and H<sub>2</sub>O than actually required for etherification, removing mechanically the excess of alkali and part of the excess of H<sub>2</sub>O and then treating the material with a hot dry gas to evap. the remaining excess H<sub>2</sub>O.

**Cellulose ether composition.** P. C. SEHL. U. S. 1,467,071, Sept. 4. A compn. adapted for manuf. of sheets or films is formed of cellulose ethyl ether 10, propylene

**chloride** 20-30 and MeOAc 20-30 parts, with or without camphor or other ingredients.

**Cellulose ether composition.** S. J. CARROLL. U. S. 1,467,091, Sept. 4. A compn. adapted for making films is formed of cellulose ethyl ether dissolved in a mixt. of MeOAc 50-60 and monochloronaphthalene 50-40 parts, with or without triphenyl phosphate, camphor or other ingredients. U. S. 1,467,092 specifies the use of dibenzylamine together with MeOAc as a solvent for cellulose ether. U. S. 1,467,093 specifies MeOAc and ethylbenzene. U. S. 1,467,094 specifies MeOAc and dimethylbenzaline. U. S. 1,467,095 specifies MeOAc and diphenylmethane. U. S. 1,467,096 specifies MeOAc and ethylbenzylaniline. U. S. 1,467,097 specifies EtOAc and cyclohexanol. U. S. 1,467,098 specifies acetophenone and a volatile vehicle such as MeOAc. U. S. 1,467,099 specifies EtI and MeOAc or other volatile vehicle. U. S. 1,467,100 specifies ethylene bromide and a volatile vehicle such as MeOAc. U. S. 1,467,101 specifies cyclohexanone and a volatile vehicle, e. g., EtOH, MeOH, EtOAc, MeOAc or acetone. U. S. 1,467,102 specifies methylene chloride and U. S. 1,467,103 and 1,467,104 specify butyl taurate and BzH, resp., each with a volatile vehicle such as MeOAc. U. S. 1,467,105 specifies ethylene trichloride together with EtOH which together form a solvent of greater dissolving power than that of the constituents separately considered.

**Cellulose acetate compositions.** H. DREYER. U. S. 1,466,819, Sept. 4. Cellulose acetate and a plasticizer, such as xylene monoethyl (or monomethyl)-sulfonamides, are mixed with such a large amt. of EtOH, MeOH, C<sub>6</sub>H<sub>6</sub> or other volatile diluent that the solvent action of the plasticizer is restrained during the mixing operation. After the mixing is completed, the volatile solvent is evapd. to permit increased action of the solvent of high b. p. on the cellulose acetate so that the latter is progressively dissolved and plasticized.

**Cellulose acetate.** J. M. KESSLER and V. B. SEASE. U. S. 1,466,401, Aug. 28. A mixt. of HOAc and Ac<sub>2</sub>O is forced through cellulose, maintained under such pressure that satis. of the cellulose is effected with about the quantity of liquid which it is desired to have the cellulose retain. The cellulose is then acetylated by a mixt. of H<sub>2</sub>O, HOAc, Ac<sub>2</sub>O and H<sub>2</sub>SO<sub>4</sub>.

**Cellulose acetate solutions and compositions; celluloid; films; varnishes.** BRITISH CELLULOSE & CHEMICAL MANUFACTURING CO., LTD., W. BADER AND W. A. DICKIN. Brit. 195,849, March 8, 1922. Celluloid-like products, plastic masses, films, varnishes, solns. and other preps., and compns. having a basis of cellulose acetate are prepd. with the employment of trichloro-*tert*-butyl alc. as solvent or plasticizer; celluloid prepd. in this manner is tough, elastic and non-inflammable. According to the use, volatile or other solvents, diluents, plasticizers, filling materials, coloring matters, etc., may be added. In an example, celluloids are prepd. with the aid of the trichloro-*tert*-butyl alc. with or without the addn. of triphenyl phosphate or castor oil; films, by using a soln. to which acetone has been added; and a varnish, with the addn. of acetone or MeOAc. Cf. C. A. 17, 2957.

**Acetylizing cellulose.** H. P. BASSETT. U. S. 1,466,329, Aug. 28. Cellulose, e. g., cotton, is treated with an acetylizing mixt. formed of 80% Ac<sub>2</sub>O 300, C<sub>6</sub>H<sub>6</sub> or toluene 1200 and H<sub>2</sub>SO<sub>4</sub> 10 parts, the cellulose acetate formed is sepd. and the C<sub>6</sub>H<sub>6</sub> or toluene is removed from the mixt. by distn. S chloride is added to the remaining material and it is treated with Cl to form AcCl and the latter is treated with NaOAc to form Ac<sub>2</sub>O.

**Vulcanite-like material from cellulose esters.** P. BALKE and G. LYSCHUPPER. U. S. 1,468,222, Sept. 18. H<sub>2</sub>O-contg. nitrocellulose or a similar cellulose ester, without addn. of volatile solvents, is mixed with a much larger quantity of a gelatinizing agent such as Et acetylalide than is required for gelatinization of the material under treatment, and with filling materials such as barytes or CaCO<sub>3</sub> and the mixt. is heated until the H<sub>2</sub>O present is evapd. The product may be molded under pressure at a temp. of 130°.

**Filaments from cellulose acetate.** C. W. PALMER and W. A. DICKIN. U. S. 1,467,493, Sept. 11. Filaments, threads or films are formed by extruding cellulose acetate soln. in acetone, into an aqu. coagulating bath also contg. acetone or equiv. swelling agent to control the coagulation.

**Setting viscose.** A. D. CONLEY and E. C. STILLWELL. U. S. 1,467,265, Sept. 4. Viscose is "set" in a hot soln. contg. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and then soaked in an alc. soln., without intermediate drying, to produce a product of soft texture.

**Conveying wood pulp.** P. C. SCHANNING. U. S. 1,466,413, Aug. 28. Water and wood pulp to be conveyed from one vessel to another are forced into a closed conduit connecting the 2 vessels and air is introduced into the conduit at the bottom of the mixt. in the direction of flow of the latter to maintain it in bubbling condition and prevent settling of the pulp.

**Artificial fibers, films or imitation leather.** R. J. LOFFLER. U. S. 1,464,949, Aug. 14. A lignosulfo acid such as ptd. by a protein from sulfite cellulose liquor is used together with dyes, viscose, fillers and other admixtures in forming fibers, films or artificial leather which may be treated with  $\text{CH}_2\text{O}$  or other hardening agents.

**Metal-coated paper.** K. WINCKEL. U. S. 1,465,107, Aug. 14. Paper is coated with a metal powder and a bituminous binder, e. g., bronze powder and Vulk-bitumen mixed with  $\text{CCl}_4$ .

**Copying paper.** W. HARGRAVE. Brit. 196,492, May 12, 1922. A permanent copy of written or printed matter is obtained by employing a sheet which is to receive the copy and an intermediate sheet which are treated with sep. chemicals, for instance solns. of Fe sulfate, and tannin, resp., that interact to form an ink. The intermediate sheet may be smeared with glycerol, and a small quantity of sol. black or other dye may be added to the tannin.

**Washing reclaimed paper pulp.** O. C. WINESTOCK. U. S. 1,468,337, Sept. 18. Inked paper pulp is continuously fed to a washing app. in which a definite level of pulp is maintained, gradually moved through the app. to effect washing without rolling the pulp and wash water is withdrawn from the upper portion of the pulp.

**Tank for bleaching paper pulp.** P. K. FLETCHER. U. S. 1,466,499, Aug. 28. Material at the bottom of the tank is fed to the bottom of a central vertical cylinder within the tank and elevated through the cylinder and discharged into the upper part of the bleaching tank into contact with the soln. and material within the annular space around the cylinder.

**Removing ink stains.** A. WARTEL. Brit. 196,405, Jan. 31, 1922. Ink stains are removed from paper or cloth by applying a soln. of 28 g.  $\text{KMnO}_4$  in 18 g. of 66%  $\text{H}_2\text{SO}_4$  and 1700 l. of  $\text{H}_2\text{O}$ , and then a 35% soln. of  $\text{NaHSO}_3$ .

**Cigarettes.** E. A. CLOSMANN. Brit. 196,654, Dec. 23, 1921. Thin films of acetyl-cellulose or other cellulose esters, used as substitutes for cigaret-paper, are rendered opaque by evapg. solns. of esters, also contg. 1-2% of nitrocellulose, upon a rough surface such as a frosted glass plate, the plate being first rubbed with a finely powd. pigment such as chalk. Transparent longitudinal edges and suitable designs may be produced upon the films by allowing the corresponding portions of the plates to remain smooth. Cf. 4,959, 1910.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

**Improvements in the manufacture of cannon powder.** E. CHEVEREAU. *Mem. poudres* 20, 151-80(1923).—Discusses improvements made during the World War in the manuf. of smokeless powder (Poudre B) in France, with a view to replacing manual labor by mech. devices. Processes discussed are (1) a method of coiling the powder strips on reels before cutting, (2) elimination of waste in the cutting process, (3) automatic sorting of grains, (4) automatic handling of the powder from the cutting machines to the driers. In the latter process the cut strips are conveyed from the cutters by means of a current of water in a conduit to the soaking vats where a large part of the original 15-20% of solvent in the powder is absorbed by the water, pumped in a closed circuit, and subsequently recovered. C. G. STORM

**The freezing point-solubility diagram of the system tetryl-picric acid.** C. A. TAYLOR AND WILLIAM H. RINKENBACH. *Ind. Eng. Chem.* 15, 1070-1(1923).—This system affords a different type of curve from those found for TNT-tetryl and TNT-picric acid systems (*C. A.* 17, 879, 3100). A compd. of 1 mol. each of the components was found which showed a strong tendency to supercool. Phys. characteristics prevent the data found from being of value for use in analytical detns. CHARLES E. MUNROE

**Examples of the use of liquid air explosives (Weber process).** CHARLES BENOIST. *Rev. ind. minérale* 1923, 441-65.—An illustrated description of the *Weber process* and results obtained by its use. C. C. DAVIS

**Four die in explosion at Bureau of Standards.** ANON. *Chem. Met. Eng.* 29, 639(1923).—The explosion occurred Sept. 20, 1923, during the course of a research on the internal combustion of engine fuels of differing volatilities. Gasoline of high volatility for aviation purposes was being tested in an engine operating within an altitude chamber so constructed of concrete that a vacuum could be maintained within, while all the observations and measurements could be made from the outside. It is believed that by a leak in the feed line leading to the carburetor of the engine, or in the

carburetor itself, due to the sticking of the float mechanism, a mixt. of gasoline vapor and air was formed within the chamber which was ignited, probably, by back-fire through the carburetor. The members of the exptl. staff were all outside the chamber and were injured by the blast, by flame or by the debris. It is estd. that not over a quart of gasoline could have escaped into the chamber. CHARLES E. MUNKER

**The sorting of Poudre B.** NUSBAUMER. *Mém. poudres* 20, 181-200(1923).—A discussion of methods developed at the Rijpault smokeless powder factory to reduce the % of strip powder grains of irregular size and shape. A reduction from 5 9% to 1-2% was effected. C. G. STORM

**A new calcium chloride sprinkler system.** R. P. SIMS. *Quart. Nat. Fire Protection Assoc.* 16, 267-75(1923).—A detailed description of a combination CaCl<sub>2</sub>-water sprinkler system in the Cold Storage Warehouse of the Montreal Harbour Commissioners. No corrosion difficulty has been encountered. CaCl<sub>2</sub> soln. is discharged from a tank on the roof until a predctd. low level is reached, when the city water supply is automatically turned into the pipes. Alarms are provided to operate whenever the rate of temp. rise in any cold storage room exceeds 15° F. per min. The CaCl<sub>2</sub> and dry-pipe systems are compared. C. L. JONES

Fertilizer plant fire record (ANON) 15. Solvent recovery (Mu,NR) 13. Fires in pyroxylin plastic manufacturing plants (Mu,NR) 18. Blasting of zinc blocks (Hoff-KN) 9.

**Explosives.** UNION GENERALE COOPÉRATIVE. Brit. 197,518, April 26, 1922. A propellant explosive charge comprises a liquefied gas having a low crit. temp. and a progressively burning solid explosive or liquid combustible, the liquefied gas being in sufficient quantity to act by vaporization as well as to support combustion if required.

**Explosives.** ÉTABLISSEMENTS DAVEY, BICKFORD, SMITH, ET CIE. Brit. 196,593, March 19, 1923. Pb azide for use in primers is insensitized by the addn. of between 0.05 and 20% by wt. of oils, greases, or paraffins.

**Explosives.** W. D. BORLAND, T. J. NOLAN and NOBEL'S EXPLOSIVES CO., LTD. Brit. 196,108, Jan. 24, 1922. For hardening grains of fibrous nitrocellulose explosives, use is made of cyclohexanone, cycloheptanone, and their homologs including *o*, *m*-, and *p*-heptanone. In one example 81 parts by wt. of nitrocellulose, 10 parts of Ba(NO<sub>3</sub>)<sub>2</sub>, 2 parts of starch, preferably in a boiled state, and 7 parts of mineral jelly are incorporated wet in an edge runner. The mixt. is passed through a sieve of 10 meshes to the in., and granulated in a steam-jacketed revolving pan. The correct sizes of grains are then sifted out and dried; and 100 parts of the dry grains are sprayed with 80 parts of a hardening comprn. contg. 10% of cyclohexanone and 90% of alc. The grains are hardened by heat, which drives off the solvent. The last traces of solvent are removed, and the explosive is finally conditioned for use by air exposure. Cf. 166,277 and 166,502.

**Explosive containing nitrated xylose.** S. G. NORTON. U. S. 1,466,147, Aug. 28, 1923. A stabilized explosive is formed of trinitroglycerin 60-80 and nitrated xylose 20-40%, with or without other ingredients.

**Mercury fulminate.** E. A. BARNES. Brit. 198,287, Oct. 23, 1922. See Can. 230,045(C. A. 17, 2051).

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**The new dyestuffs industry of Great Britain.** G. T. MORGAN. *Chemistry & Industry* 42, 868-74(1923). E. J. C.

**The production of diamine fast red F.** H. HERLINGER. *Color Trade J.* 13, 85-6 (1923).—A formula and directions are given. CHAS. E. MULLIN

**Certified methylene blue for biochemical stains.** ANON. *Color Trade J.* 13, 86-7(1923).—The requirements of the Commission on Standardization of Biological Stains for methylene blue, as well as a list of concerns for which samples have been approved, are given. CHAS. E. MULLIN

**The "Espinasse" laboratory automatic dye tester.** R. BOUPLERS. *Bull. soc. ind. Rouen* 51, 281-3(1923).—The app. consists essentially of a horizontal porcelain cylinder placed slightly above the level of the dye bath and suitably driven by an elec. motor. As the test skein emerges slightly from the bath, the progress of the dyeing is easily followed. A. PAPINEAU-COUTURE

The spectrophotometric method for the investigation of dyes on fabrics in transmitted light. N. USPENSKI AND G. WORONKOFF. *Z. Physik* 17, 112-6 (1923).—Several references to the literature are given. The study was made by means of a polarization spectrometer. To increase transparency the fibers to be examd. were imbedded in some medium, such as Canada balsam, whose index of refraction is about the same as their own. A certain wt. of the colored fibers was evenly distributed between two cover glasses held accurately parallel. To secure even illumination of field the object under examn. was rotated rapidly. A detailed description of the method is to appear later. Absorption curves are given for crystal violet in water and on silk, mounted in air and in Canada balsam. Absorption maxima obtained for a number of dyes are given, together with data obtained by Formanek, for comparison. Several problems are suggested to which the method is considered applicable. H. B. GORDON

Bleaching by means of percarbonates. BOLS. *Avenir textile* June 1923; *Industrie chimique* 10, 411 (1923).—Brief description of the merits of  $\text{Na}_2\text{C}_2\text{O}_4$  as bleaching agent for textiles. A. PAPINEAU-COUTURE

The protective action of antioxidanting substances against the alteration in colored fibers produced by light. P. SISLEY. *Bull. soc. chim.* 33, 1079-81 (1923).—A resumé of previous observations (cf. *C. A.* 16, 3789). I. P. ROLF

Properties of dyed materials. H. WALES. *J. Am. Chem. Soc.* 45, 2420-30 (1923).—A study of the absorption spectra of light reflected from wool dyed with 17 dyes showed that the reflection spectra more nearly explain the variations in color between 2 dyes than do the transmission spectra of the solns. of the dyes. The reflection spectra of filter paper stained with any of the xanthene dyes or of thin gelatin films of Eosin BN or Erythrosine deposited on glass plates corresponded to those of the dyed wool while the transmission spectra of the gelatin films corresponded to those of the aq. solns., indicating that the dyes are actually dissolved in the wool. C. A. R.

Wool washing and its by-products. M. RINDL. *S. African J. Ind.* 6, 204-10, 336-41 (1923).—The subject is discussed under the following divisions: Structure and compn. of wool fiber, reactions of wool fiber to various reagents, impurities in the wool, functions and compn. of suint and yolk, cleansing methods: (a) the scouring process, (b) extn. with volatile solvents, (c) cleansing by substances which mechanically soak up the grease, and (d) the recovery of wool grease from scouring liquors. L. W. RIGGS

Caroá fiber. F. TOBLER. *Faserforschung* 3, 228-33 (1923).—Caroá is a South American name for certain fibers of the Bromelia family. It is claimed that by cooking with  $\text{Na}_2\text{CO}_3$ , a fiber may be obtained which, while inferior to jute for textile purposes, is a high grade of cellulose suited to fine paper mfg. and artificial silk. E. R. CLARK

The pita plant. F. A. STOCKDALE. *Tropical Agriculturist* 60, 337-45 (1923).—Expts. with Colombian pita show it to be excellent as a com. fiber. Chem. examn. showed the following data reported on the dry basis: ash 0.6%, hydrolysis loss 29.4%, acid purification loss 2.7%, loss on washing in  $\text{H}_2\text{O}$  2.1%, cellulose 74.7%. M. S. ANDERSON

#### Removing ink stains (Brit. pat. 196,405) 23.

**Dyes.** L. CASSELLA & Co., Ges. Brit. 198,077, Feb. 27, 1922. Vat dye stuffs, which are most probably oxazoles and thiazoles of the anthraquinone series, are obtained by condensation of the azomethine compds. derived from anthraquinone-2-aldehyde or a substitution product thereof, and an *o*-aminophenol, or an *o*-aminothiophenol or an equiv. thereof; the condensation is effected by heating alone or with a solvent, and with or without a condensing agent such as Na acetate,  $\text{ZnCl}_2$ , or  $\text{H}_2\text{SO}_4$ . A mixt. of an anthraquinone-2-aldehyde with a 1-aminophenol or an *o*-aminothiophenol may also be condensed directly to the dyestuff without isolation of the azomethine compd. Equivs. of *o*-aminothiophenols are aromatic amines sulfurized in the *o*-position, such as *o*-diaminoaryldisulfides, *o*-aminoarylthiosulfonic acids and particularly the substances described in 17,417, 1914 (*C. A.* 16, 500) and 18,202, 1914, derived from the action of  $\text{S}_2\text{Cl}_2$  on primary aromatic amines, and their products of transformation. The thiazoles may also be obtained by heating with S either the azomethine compds. from anthraquinone-2-aldehydes and primary aromatic amines having one free *o*-position to the amino group, or mixts. of anthraquinone-2-aldehydes with such primary aromatic amines. The products dye vegetable fibers in fast shades from the hydrosulfite vat; those products which contain several thiazole or oxazole rings are particularly valuable. Examples are given.

**Dyes.** FARBENFABRIKEN VORM. F. BAYER & Co. Brit. 195,649, Apr. 3, 1923.

**Monoazo dyes** which dye cotton in pure red shades fast to water and light are prep'd. by coupling a diazotized aromatic aminothiazolesulfonic acid, such as one of those described in 6844, 1914 (*C. A.* 10, 270), with a mixed urea derived from 2,5,7-amino-naphtholsulfonic acid or a deriv. thereof and an acyl-*p*-arylenediamine or a deriv. thereof. Examples are given.

**Dyes.** DURAND & HUGUENIN AKT.-GES. Brit. 197,940, May 16, 1923. Benzooquinone dyes which dye and print on chrome-mordanted wool or cotton in violet to blue shades are prep'd. by warming with concd.  $H_2SO_4$  a quinone dianilide obtained from one mol. proportion of chloranil and two mol. proportions of *p*-aminosalicylic acid, or a homolog or deriv. thereof such as *p*-amino-*o*-cresotinic acid or nitroaminosalicylic acid ( $OH : COOH : NO_2 : NH_2 = 1,2,6,4$ ); instead of commencing with nitro-*p*-aminosalicylic acid the condensation product from non-nitrated *p*-aminosalicylic acid and chloranil may be warmed with nitrosulfuric acid to effect nitration and formation of the new dye-stuff simultaneously, or the heating with  $H_2SO_4$  may first take place followed by addn. of nitrosulfuric acid to effect nitration. The condensation of *p*-aminosalicylic acids with chloranil is effected in aq. suspension in the presence of  $Na(OAc)$ . Examples are given of the various methods, together with tables of properties of the resulting dyestuffs.

**Dyes.** FARBENFABRIKEN VORM. F. BAYER & Co. Brit. 198,415, Feb. 27, 1922. *Thioindigoid* dyes dyeing cotton in fast brown shades from the hyposulfite vat are prep'd. by condensing 2,1-naphthoxythiophene, or a nuclear substitution product thereof such as a halogen deriv., with isatin, or a substituted isatin such as a 5,7-dihalogen isatin, or a cyclic *o*-diketone contg. two or more nuclei, e. g., acenaphthenequinone, 1,2-diketohydrindene, 2,3-diketo-(1)-thionaphthene;  $\beta$ -naphthoisatin is however excluded. In an example 5,7-dichloroisatin is used, the condensation being effected in the presence of glacial HOAc.

**Dyes.** FARRENFABRIKEN VORM. F. BAYER & Co. Brit. 198,338, Jan. 31, 1922. *Disazo* dyes are prep'd. by coupling the tetraazo compd. from 4,4'-diaminodiphenyl-3,3'-dicarboxylic acid on the one hand with an azo dye component which contains a sulfonic or carboxylic group or two hydroxy or two amino groups, or one hydroxy and one amino group, or a hydroxy group in conjunction with the  $CH_2CO$ -group of the actoacetic-anilides or of the pyrazolones, and on the other hand with a pyrazolone or an actoacetic-anilide compd. The products dye cotton in orange to red shades which by after-treatment with metallic salts, e. g., Cu or V salts, are changed into deeper orange brown or green shades fast to light and washing. Examples are given.

**Dyes.** SOC. ANON. POUR L'IND. CHIM. À BALE. Brit. 195,753, Jan. 6, 1922. Anthraquinonylanaminonaphthoquinones are prep'd. by condensing an  $\alpha$ -aminoanthraquinone or an  $\alpha$ , $\alpha$ -diaminoanthraquinone with a  $\beta$ -naphthoquinone deriv. contg. a mobile substituent, e. g., a halogen or a sulfonic group. The resulting products on further condensation with  $\alpha$ -diaminoanthraquinones yield anthraquinone- $\alpha$ , $\beta$ -naphthazine compds. contg. anthraquinonylanino groups, which are vat dyes giving red to violet shades on cotton. Examples are given.

**Dyes.** F. W. ATTACK. Brit. 196,933, Jan. 31, 1922. Indophenolic substances are sulfurized by treatment with a polysulfide in presence of normal butyl alc. as solvent. The indophenol may be used dry or in the form of a wet paste. In an example the indophenol from carbazole and *p*-nitrosophenol is treated with  $Na_2S$  and S in the presence of butyl alc. at  $100^\circ$  and under a reflux for 50 hrs. The resulting mixt. is dild. with  $H_2O$  and the dyestuff sepd. in the usual manner. It is stated that pyridine may be used in admixt. with the normal butyl alc. According to the Provisional Specification org. compds. in general may be sulfurized as described above and pyridine alone or other inert liquid of similar b. p. may be employed as a solvent.

**Dyes; dyeing.** FARWERKE VORM. MEISTER, LUCIUS & BRÜNING. Brit. 193,866, Feb. 24, 1923. Azo dyes are obtained, either in substance or on the fiber, by coupling diazo compds. with a *p*-toluidide, a *p*-alkyloxanilide, a *p*-aryloxanilide, or a *p*-aralkyloxanilide of 2,3-hydroxynaphthoic acid, in which the arylido group contains halogen as substituent. The shades obtained on the fiber are fast to kier-boiling, especially those derived from halogenated diazo components. Examples are given.

**Dyes; dyeing.** A. G. GREEN, K. H. SAUNDERS and BRITISH DYESTUFFS CORPORATION, LTD. Brit. 197,809, April 5, 1922. *N*-Methyl-3-sulfonic acids of diaminoazo compds. are obtained by  $Na_2S$  reduction of compds. of the general formula  $XN_2Y-NHCH_2SO_3H$  or  $XN_2YNZNHCH_2SO_3H$  (in which X contains a *p*-nitro group), the *N*-methyl- $\omega$ -sulfonic groups remaining intact; a second  $\omega$ -sulfonic residue can then be introduced into the mol. by treatment with formaldehyde-bisulfite. Examples are given. Cf. 41,343.

**Condensation product of carbazole and *p*-nitrosophenol.** W. LEWCOCK and S. B. TALLANTYRE. U. S. 1,465,853, Aug. 21. One of these compds. in subdivided solid form is gradually mixed with a soln. of the other, e. g., carbazole is mixed with a soln. of *p*-nitrosophenol in approx. 93% H<sub>2</sub>SO<sub>4</sub>, at a temp. of about -20°, the reaction mixt. being maintained at approx. this low temp. throughout the condensation and the condensation product sepd. by addn. of the reaction product to dil. aq. NH<sub>3</sub> soln. in excess. The condensation product thus obtained is a brownish purple solid which on thionation yields a good dye.

**Dyeing furs, skins, hairs and feathers.** P. ONNERTZ. U. S. 1,466,747, Sept. 4. Dyeing is effected by use of H<sub>2</sub>O<sub>2</sub> or other oxidizing agent together with a soln. of a 4-amino-1-hydroxybenzene contg. a negative substituent, e. g., 2-nitro-4-amino-1-hydroxybenzene, which dyes reddish brown with Cr or Cu mordants. Cf. C. A. 17, 2196.

**Dyeing cellulose ethers.** H. DREYFUS. Brit. 196,952, Nov. 30, 1921. Insol. cellulose ethers in thread, film, fabric, or other form, or mixed goods contg. them, are dyed or printed with acid dyes or direct cotton dyes. The dyes may be dyed on mordants, or be after-chromed or treated with Cu salts, etc. In examples, ethyl cellulose silk is dyed with Congo Red, Diazo Fast Black, Nigrosine B, Alizarine Astrol B, Azo Yellow 3 G, Roccelline, and Orange 11. Cf. 182,830 (C. A. 16, 4356).

**Dyeing cellulose ethers.** H. DREYFUS. Brit. 196,953, Nov. 30, 1921. Insol. cellulose ethers in thread, film, fabric, or other form, or mixed goods contg. them, are dyed or printed with basic dyes. Mordants may be employed, or the dyeings may be after-treated by known methods. In an example, ethyl cellulose silk is dyed in a bath contg. AcOH with the following dyes: Magenta, Malachite Green, Rhodamine Red B, Methyl Violet O, Auramine O, Safranine T, Thioflavine T, or Methylene Blue B.

**Dyeing cellulose ethers.** H. DREYFUS. Brit. 196,954, Nov. 30, 1921. Insol. cellulose ethers in thread, film, fabric, or other form, or mixed goods contg. them, are dyed by forming azo dyes on the material or by forming thereon aniline blacks, paraffine browns, etc., by oxidation of aromatic bases. In examples, Partraniline red and aniline black are formed on ethyl cellulose silk. A list of suitable bases and developers for forming azo dyes is also given.

**Dyeing cellulose ethers.** H. DREYFUS. Brit. 197,281, Nov. 30, 1921. Insol. cellulose ethers in thread, film, fabric, or other form, or mixed goods contg. them, are dyed with vat dyes. In an example, ethyl cellulose silk is dyed with indigo in a hypo-sulfite vat; anthraquinone vat dyes are also specified as suitable.

**Dyeing cellulose acetate.** BRITISH CELLULOSE & CHEMICAL MANUFACTURING CO., LTD. AND W. BADER. Brit. 195,920, Nov. 2, 1921. The partial alk. sapon. of cellulose acetate goods (threads, films, fabrics, etc.), to facilitate dyeing thereof, is effected by means of substantially cold caustic alkali solns. of less than 1% strength. The saponifying action of the soln. being enhanced by suspending therein or pptg. on the surface of the goods finely divided solids. Clay or Al<sub>2</sub>O<sub>3</sub> or silicic acid gel, prep'd. so as to be insol. in cold dil. alkali, may be added to the soln., or the goods may be dipped successively in two liquids which form an insol. ppt., such as CaCO<sub>3</sub>, MgO, MgCO<sub>3</sub>, Al oleate or Ca oleate. In a modification, alkali aluminates are dissolved in the saponifying liquid; these deposit a colloidal hydrosol on the goods. The goods may be pre-treated with salt solns., with or without a little alkali or alk. earth hydroxide, as described in 194,244 (C. A. 17, 3612). Mixed goods contg. cellulose acetate and cellulose threads may be treated by the process. Cf. 20,672, 1910, and 175,486 (C. A. 16, 2230).

**Dyeing cellulose acetate.** BURGESS, LEDWARD & CO., LTD. AND W. HARRISON. Brit. 193,646, Feb. 4, 1922. In a single-bath process for forming azo dyes upon cellulose acetate silk the amino component and the second component are absorbed by the silk from a single hot bath and the HNO<sub>2</sub> or nitrite and acid are then added to the same hot bath; diazotization is thus effected at temps. of 30° to 80° and the color is rapidly developed. The amino compds. are dissolved in the bath by means of acids and the phenolic components by means of alkalies, and their absorption is facilitated by the addn. of salts such as NaOAc; protective colloids may also be added. The dyeings may be shaded by addn. of basic dyes to the vat, and the dyeings may be after-treated in acid soln. with reducing agents such as formaldehyde-hydrosulfite or SnCl<sub>2</sub> to remove any loose color. Examples are given. Cf. C. A. 17, 2964.

**Artificial silk.** W. J. STEVENSON. Brit. 198,392, Jan. 30, 1922. A soln. of Na<sub>2</sub>SO<sub>4</sub> is employed as the coagulating bath in the manuf. of artificial silk from cellulose nitrate; the latter is dissolved in acetone or other suitable solvent, and the nitrate employed is preferably that described in 130,029 (C. A. 14, 123).

**Coated fabrics.** H. E. BROWN and J. H. STOVER. U. S. 1,465,541, Aug. 21. A sheet of nonwoven unspun cotton or other fibers is impregnated with a rubber cement or other suitable elastic binding material, the sheet is then split so that rough surfaces are obtained by the sepn., and this roughened surface is treated with a rubber, asphaltic boiled oil or similar coating mix.

**Treating fabrics.** CALICO PRINTERS' ASSOCIATION, LTD. AND E. A. FOURNAUX. Brit. 196,696, Jan. 27, 1922. Cotton fabrics are mercerized by treating them with alkali either before or after, or both before and after treatment, with a hot soln. of Ca thiocyanate or other thiocyanate or mixt. of thiocyanates known to be a solvent of cellulose. The fabric, after treatment, with alkali, may be impregnated with hot or cold thiocyanate and then passed through an atm. of hot air, steam, gas, or vapor. It is then washed and dried, and may be again mercerized and dried. Cotton fabrics are also ornamented by first mercerizing with alkali, then printing or padding with a paste consisting of a concd. soln. of Ca thiocyanate, etc., thickened by means of cellulose or acetylcellulose, etc., to which coloring matters, pigments, etc., may be added. The fabrics are then, either after previous drying or not, exposed to the action of heat in the presence of moisture, by passing through steam, etc., or a hot soln. of  $\text{CaCl}_2$ , or a weak soln. of HCl. The fabrics are then washed, dried, and mercerized with alkali. The effects obtained by these processes may be enhanced by printing resists on the fabric. The specification refers to the use of cotton pulp, and to the use with starch pastes of colors or pastes suitable for the ordinary crimping process, the colors being developed by subsequent aging or steaming.

**Treating vegetable fibers.** HEBERLEIN & CO., AKT.-GES. Brit. 196,298, April 14, 1923. In the treatment of vegetable fibrous materials with concd. mineral acids to produce wool-like and transparent effects, the action of the acid may be prolonged without hydrolytic degradation of the cellulose by the addn. of heterocyclic bases, particularly pyridine and its homologs. Mercerized cotton fabric is treated for 5 min. with 9 parts  $\text{H}_2\text{SO}_4$ , 56.5° Bré., and 1 part of pyridine.

**Treating textile fibers.** D. McINTOSH and G. MCINTOSH. Brit. 196,003, Oct. 15, 1921. In bleaching and like treatment of textile fibers, particularly wool and animal fibers, such as yarns, the fiber, which may be dyed, is immersed in  $\text{H}_2\text{O}_2$  and then immediately removed and subjected to a thorough wringing to remove excess moisture so that the wt. of  $\text{H}_2\text{O}$  is less than the wt. of dry yarn. The goods may be stoved after treatment without an intermediate washing.

**Treating cotton.** E. KNECHT. Brit. 195,870, Apr. 10, 1922. The natural wax in cotton is softened by treating the dry cotton either in the raw state or in any stage prior to the actual spinning process with an alden. or charged with the vapor of a hydrocarbon such as solvent naphtha, hydrogenated tar oils, petroleum oils, oil of turpentine, rosin oil, tetrachloroethane, chlorobenzene, phenetole or like solvent. Cf. 25,206.

**Treating yarns.** L. CASSELLA & CO., GRS. Brit. 198,166, April 11, 1922. In the production of shot effects, animal fibers are treated with  $\text{Ag}_2\text{O}$ . The treatment may be effected cold or hot, and may be accelerated by the addn. of aromatic sulfonic acids, condensation products thereof with aldehydes, free mineral acids and their salts with weak bases, e. g.,  $\text{Al}_2(\text{SO}_4)_3$  or dimethylaniline sulfate. Where the material is intended to be interwoven with white yarn, the material after dyeing is treated with a Cr salt such as Cr fluoride.

**Bleaching cotton yarns.** J. BRANDWOOD, T. BRANDWOOD and J. BRANDWOOD. Brit. 197,786, March 10, 1922. Cotton yarns in the compact wound form, such as the cop, cheese, or beam, are bleached by the combined chem. and mech. action of bleaching liquor which is circulated through the yarn packages under pressure, or drawn through by suction. The yarns are treated as received from the winding operation without preliminary treatment with alkali. Nascent bleaching liquor obtained by the process described in 196,708 (C. A. 17, 3757) may be employed in conjunction with app. of the type set forth in 551,1913 (C. A. 8, 2257) and 190,760. Treatment with acid after bleaching may be dispensed with.

**Protecting animal fibers from alkaline reagents.** P. ONNERTZ, A. PETERS and B. SCHWARTZEL. U. S. 1,466,748, Sept. 4. Animal fibers are protected from injurious action of alk. liquids, e. g., in alk. treatment of half-wool fabrics, by adding to the liquid a compd. of the general formula  $\text{RCOHR}'\text{OSO}_2\text{M}$ , where R and R' are univalent substituents, such as Na formaldehyde bisulfite.

**Carrotting hair.** A. CHEVALIER. U. S. 1,466,698, Sept. 4. Hair for use in the manuf. of hats while still on the skins is subjected to the action of a sol. sulfide, e. g., a 4% Na sulfide soln., and allowed to dry in air to effect oxidation of the sulfide and check its destructive action.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Some factors which affect the plasticity of a paint. E. C. BRINGHAM AND A. G. JACQUES. *Ind. Eng. Chem.* 15, 1033-6 (1923).—The effects on mobility and yield values of paints produced by long grinding, by changing the concn. of the pigment, by adding soaps, water, mineral oil, deflocculating agents, etc., are measured and tabulated.

F. A. WERTZ

Substances that prevent the jelling of tung oil. F. H. RHODES AND T. J. POTTS. *Chem. Met. Eng.* 29, 533 (1923).—A detn. of the comparative efficiency of various substances in preventing the gelatinization of tung oil on heating, placed them as follows: glycerol, oleic acid, rosin, ester gum, paracoumarone resin, and linseed oil. Results are tabulated and shown graphically. The presence of 6% of glycerol prevents gelatinization of tung oil. This mixt. with lead linoleate added to give 0.02% Pb, heated to 280° until sufficiently bodied, and then thinned with turpentine gave rapid drying, smooth, tough, transparent films.

F. A. WERTZ

Some hydrogenation products of benzene and naphthalene. NOEL HEATON. *J. Oil & Colour Chemists' Assoc.* 6, 93-109 (1923).—A summary of the phys. and chem. properties, methods of manuf., and uses of cyclohexanol (hexalin), methylecyclohexanol (methylhexalin), tetralin and decalin.

F. A. WERTZ

Manufacture of artificial resins. A. DOLCIS. *Rev. chim. ind.* 32, 185-90, 211-20 (1923).—A review covering synthetic resins prep'd. by action of aliphatic aldehydes or aromatic phenols, amines and hydrocarbons.

A. PAPINEAU-COUTURE

Technical importance of resin-forming groups and bonds characteristic of resins. A. EBNER. *Z. angew. Chem.* 36, 33-6 (1923).—A review and discussion of investigations of the relation between resinification and chem. constitution and of the development of artificial resins.

C. C. DAVIS

**Paints.** D. GARDNER. Brit. 195,996, Oct. 11, 1921. Pigments comprising compds. of metals of the fourth, fifth, and sixth groups of the periodic system are used. The pigments consist of a base and a filler, both being compds. of metals of the same group, that have been calcined at a temp. not exceeding 600°. All ingredients must be free from moisture, and the pigment is preferably mixed, while still hot, with the vehicles, driers, etc. Impurities are removed from the oxide or salt chosen as base, and moisture is removed by calcining. The base is then mixed with the calcined filler, or the mixing may precede the calcining. The pigment is crushed and sieved, and is mixed with the other ingredients such as oils, chlorinated or aromatic hydrocarbons, turpentine, turpincol, dipentene, etc., in a mill. In making pigments, equal parts of bases such as TiO<sub>2</sub> or Zr oxide or silicate and fillers, such as keiselschl. SiO<sub>2</sub>, and silicates may be used. Equimol. amts. of Sb oxide is preferable as a filler for bases of the fifth group, and Mo oxide for bases of the sixth group. For heat-resisting and waterproof paints, moisture is eliminated by stirring equal parts of pigment and an oil such as linseed, maize, castor or menhaden oil, in an autoclave under 5-8 atm. pressure. Examples are given.

**Paints; bitumen.** D. GARDNER. Brit. 195,995, Oct. 11, 1921. Bitumens, asphaltites, etc., are prep'd. for use in the manuf. of black paints, varnishes, etc., by treating them with acid or alkali or both, washing to remove the sepd. substances, heating to 125° to 140° to remove volatile hydrocarbons, skimming or otherwise removing H<sub>2</sub>O, and sieving the hot product. During the heating, the bituminous material is stirred, either mechanically, or by the introduction of dry or superheated steam, into a closed app. in which, to avoid oxidation, the air is replaced by an inert gas. The product is finely ground and treated with solvent naphtha, or other solvent boiling between 80° and 180° and contg. hydrocarbons of the satd., unsatd., aromatic, terpene, or any other of the cyclic compd. types. The operation may be effected by continuously stirring at atm. pressure, or by treatment in an autoclave at 5-8 atm. pressure and at a temp. up to 180°. When pressure is used, the solvent employed may be cymene prep'd. *in situ* by the interaction of turpentine and anhyd. CuSO<sub>4</sub>. The bituminous ext. is sepd. and dried. Paints or varnishes are obtained by mixing the ext. with suitable solvents, fillers, driers, etc., all thoroughly dried. The noninflammability of the paints is improved by the use as solvents of HCHO, CCl<sub>4</sub>, dichloro- and tetrachloro-ethylene, tetrachloroethane, or the Cl compds. of benzene, toluene, and other aromatic hydrocarbons. When using the dichlorobenzenes, improved results are obtained if up to 5%

of *o*- or *p*-triphenyl phosphate or tricresyl phosphate is added. The Cl compd. in amts. up to 25% is added in small quantities in the presence of about 1% of resinites and Acheson graphite, or up to 1.5% of C silicide or other silicides. Volatile solvents such as benzene or gasoline improve the luster of the paints, etc.

**Pigments.** E. F. KUR and F. WILKINSON. Brit. 198,212, May 26, 1922. Ultramarine is formed by heating to 700° (1000°) a mixt. of calcined china clay and an alkali polysulfide other than a polysulfide of NH<sub>3</sub>. In an example, 30-40 parts of calcined china clay free from Fe and lime are mixed with 15-30 parts of Na trisulfide and the mixt. is heated for at least 6 hrs.

**Testing covering power of paints and pigments.** A. H. PFUND. U. S. 1,408,075, Sept. 18. Two juxtaposed layers of paint or pigment are spread on a background, one of the layers being of greater thickness than required completely to hide the background. The other layer is adjusted in thickness until its hiding power is substantially equal to that of the comparison layer and the required thickness of the layer is taken as the measure of hiding power of the material being tested.

**Paint-removing composition.** A. W. SCHOLES. U. S. 1,467,654, Sept. 11. NaOH 90 and (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> 10%.

**Ink.** A. B. DICK CO. Brit. 197,260, Oct. 10, 1922. See U. S. 1,439,356 (C. A. 17, 888).

**Printing-inks.** ALCHEMIC GOLD CO., INC. Brit. 198,308, Feb. 13, 1923. Metallic-pigment inks for use with heated dies, etc., for stamping book covers, labels, etc., and applicable also for ordinary printing, are made with a vehicle consisting of a synthetic resin binder, such as coumarone resin, dissolved in a neutral solvent, such as terpineol, or a mixt. of terpineol and a small proportion of rosin oil.

**Synthetic resins.** HOLZVERKOHLUNGS-INDUSTRIE AKT.-GRS. Brit. 196,265, Mar. 27, 1923. Resins are obtained by the interaction of aromatic hydroxy compds., such as phenols and naphthols, with CH<sub>2</sub>Cl<sub>2</sub> in the presence of NH<sub>3</sub>. Usually two or more mols. of NH<sub>3</sub> are employed for each mol. of CH<sub>2</sub>Cl<sub>2</sub>. Other bases, such as NaOH, may be added to facilitate the reaction. According to the example, phenol is heated for some hrs. with CH<sub>2</sub>Cl<sub>2</sub> and NH<sub>3</sub>/H<sub>2</sub> at a temp. of 150°, a yellow resinous product being obtained.

**Extracting resin from wood.** E. SCHELLER. U. S. 1,465,565, Aug. 21. A double-walled receptacle filled with pieces of resinous wood and oil of turpentine is heated to 140-50° and vapors of H<sub>2</sub>O carrying some of the oil are allowed to escape while the remaining oil penetrates into the wood and exts. the resin. Oil satd. with resin is permitted to flow to an oil reservoir where it is heated to 140° and is thence conducted back to the double-walled extn. vessel. This procedure is repeated until the sp. gr. of the oil and resin soln. does not increase further. Oil of turpentine is then distd. from the wood with steam and oil is also distd. from the extd. resin.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**The saponification of fats.** The influence of the absorption of emulsifier at the boundary of fat and water phase on the saponification velocity of boiling emulsions. J. P. TREUB. *Rec. trav. chim.* 42, 556-67 (1923).—It is pointed out that in the sapon. of fats with dil. mineral acid and stearonaphthalenesulfonic acid as emulsifier (Twitchell process) the increase of the surface of contact between fat and aq. soln. alone cannot explain the influence of the said emulsifier on the reaction velocity. An equation was deduced showing that the emulsifier increases the concn. of the H ions at the interface also, and consequently the sapon. velocity per unit of area of the surface of contact. By the increase of the surface of contact and the increase of the H-ion concn. at this surface, the influence of the Twitchell emulsifier is explained. From the deduced equation it appears that the emulsifier repels the mineral acid from the boundary of fat and H<sub>2</sub>O. Addn. of mineral acid therefore cannot proportionally increase the sapon. velocity, which deduction is in accordance with the facts. Analogous considerations on the sapon. with lye show that the abnormal decrease of the sapon. velocity near the end of the reaction is due to the repulsion of the OH ions from the surface of contact by the adsorbed soap. It appears that the emulsifiers used in sapon. in acid media increase both surface of contact between fat and water phase and sapon. velocity per unit area of this surface; in sapon. in alk. media, however, the soap formed increases the surface of contact but decreases the sapon. velocity per unit area. E. J. WIRZMANN

**Effect of composition on the complete hydrogenation of some Philippine oils with nickel catalyst.** A. P. WEST AND LOUIS GONZAGA. *Philippine J. Sci.* 23, 277-92 (1923).—Lumbang oil was reduced to a hard solid of 1.08 I no. and m. p. of 67.5° to 71.5°. Pili nut oil when hardened had an I no. of 0.76 and m. p. of 66° to 66.8°. Coconut oil when completely hardened had no I no. and m. p. of 32 to 43°. Palomaria oil when hardened was not reduced to a hard solid of high m. p. and low I no. Oils hydrogenated with catalysts contg. different percentages of Ni showed that, for a definite period of absorption, an increase in the concn. of Ni gave a decrease in the I no. and an increase in the m. p. E. SCHERUBEL.

**Some notes on the action of fuller's earth on vegetable oils.** D. WESSON. *Cotton Oil Press* 7, No. 6, 28-30 (1923).—When fuller's earth which has been used to bleach cottonseed oil is extd. with gasoline only, the absorbed oil is removed. By treating the gasoline-extd. earth with acetone or  $\text{Fe(OH}_3\text{)}$  a dark viscous substance is obtained. This was once thought to be the oil color but has been proved to be largely oxidized oil. Refined cottonseed oil was bleached with 3 successive portions of fuller's earth and the % of gasoline and acetone exts. detd. Seven commercial earths were tested in this way and it was found that with 1 exception there was no improvement in the color of the oil after the first bleach. With a very fine Florida earth there was darkening of the oil in the 2nd and 3rd bleaches. The adsorption for all the earths averaged 8 to 10% on the wt. of earths. With Filtral it was 16.6% and with Death Valley 31.4%. The loss calcd. to wt. of oil treated was 1.15% to 1.73% except for Filtral and Death Valley. These showed 2.49% and 4.71%, resp. A titration of a suspension of the earths with  $\text{Fe}(\text{SO}_4)_2 \cdot (\text{NH}_4)_2\text{SO}_4$  showed the best bleaching earth, which also gave the highest adsorption loss, had the lowest oxidation effect on the  $\text{Fe}(\text{SO}_4)_2 \cdot (\text{NH}_4)_2\text{SO}_4$ . The best bleaching earths also increased the acidity of the oils the most. H. S. BAILEY

**Standard of purity of olive oil.** C. E. SAGE. *Pharm. J.* 110, 515-6 (1923).—The Brit. Pharm. and com. standards are compared. They do not always agree, as e. g., some pure olive oil may give the test for sesamum oil, and arachis oil when tested for by the B. P. method may escape detection in an impure oil. The term "refining" used in B. P. should not apply to the neutralizing treatment of a low grade rancid oil, e. g., of 8-10% acidity. The taste of a treated oil becomes quickly unpleasant, while the flavor of a natural oil improves with age. The I no. limits of 79-87 given in B. P. are fair, and allow for slight acidity since this involves a rise in I no. The limits found by S. in the English market are 80-5. The raising of the I no. limit is not advisable, as it also tends to invite admixt. with arachis or rape oil. S. WALDBOTT

**The detection of olive oil in some refined vegetable oils.** W. H. DICKHART. *Am. J. Pharm.* 95, 684-6; *Cotton Oil Press* 7, No. 6, 34 (1923).—D. recommends the following method for the detection of olive oil: Soln. "A." Pour slowly one part of concd.  $\text{H}_2\text{SO}_4$  into 4 parts of abs. alc., placing the graduate in cold water if necessary to reduce the temp. Soln. "B." A 2% alc. soln. of furfural. Place 5 cc. of sample in a test-tube, add 5 cc. of soln. "A" and shake to form an emulsion; then drop into this emulsion 10 drops of soln. "B" and again shake. A pink color at this stage indicates sesame oil. Place the tube in the hot water bath, which must read 94° to 95°, and heat for 1½ min., shaking every few sec. Remove from the bath and add 10 cc. of cold water. Again shake and allow it to stand for 5 to 10 min. A red color of the soln. indicates olive oil. All the other oils (corn, castor, china wood, hemp-seed, kapok, peanut, perilla, palm, palm-kernel, lumbang, mustard, rape-seed, tea-seed, linseed, soy-bean, coconut, and tobacco-seed) tested gave a milky soln. wher. treated in the same way. W. G. G.

**Report on some of the non-glyceride constituents in crude cottonseed oil.** G. S. JAMIESON AND W. F. BAUGHMAN. *Cotton Oil Press* 7, No. 5, 29-30 (1923).—When filtered crude cottonseed oil stands for some time a sediment partly insol. in acetone seps. This is similar to the material ptd. by water on heating. The settling from a barrel of crude oil were sepd., drained, then thoroughly washed with acetone. The acetone-insol. residue was washed and kneaded with abs. alc., again with acetone and this treatment repeated. Finally the bright yellow powder thus obtained was dried in a vacuum desiccator. This portion insol. in acetone (or petroleum ether), which constitutes 0.1 to 0.2% of the crude oil, contains proteoses, peptones, resin, pentosans, raffinose and inositol phosphates. The pentosans were 1.74% and raffinose 4.2% of the settling and it is estd. the inositol phosphoric acid was 12%. Xanthophyll and a wax are probably also present. Resin is the only constituent so far isolated in appreciable amts. from the acetone-sol. portion of the settling. Protein, starch, tannin, gossypetin, quercetin, isoquercetin and quermeritrin were not found. H. S. BAILEY

**Report of the Cotton Seed Analysis Committee of A. O. C. S.** D. C. PICARD. *Cotton Oil Press* 7, No. 3, 29-31 (1923); cf. *C. A.* 16, 4075.—The Smalley-Copes method

for analysis of cotton seed (*C. A.* 14, 2330) is unsatisfactory for routine work. To obtain a representative sample 3-6 sep. extns. must be made. Work of 4 collaborators on a modified Malowan method shows promising results but there are still some details that should be studied before it is officially adopted. To det. moisture mash (do not grind) 5 + g. of seed in a mortar and dry at 105° for 3.5-5 hrs., depending on the wetness of the seed. To det. oil weigh 25 or 50 g. of seed into a 250-cc. beaker, add 100 cc. dil. HCl (2 pts. acid + 3 pts. H<sub>2</sub>O) and stir the seed until it is thoroughly moistened; then pour off the acid and drain. Dry on a porous plate at 130° for 1 hr., cool, weigh, and grind the sample to pass a 30-mesh sieve. Ext. 4 g. for 5 hrs. with petroleum ether, and calc. % ext. to basis of original seed. Det. ammonia on 1.7035 g. of the ground delinted seed and figure to original moisture basis. Results of 4 collaborators on 9 samples are tabulated.

H. S. BAILEY

**Report of the Extraction Committee of A. O. C. S.** FELIX PAQUIN. *Cotton Oil Press* 7, No. 3, 28(1923); cf. *C. A.* 16, 4075.—There is nothing gained by drying normal cottonseed meal before extn. with petr. ether; 3 hrs. extn. is sufficient to give concordant results. The results of 4 collaborators on 30 meals are tabulated.

H. S. B.

**Report of the Soy-bean Oil Refining Committee of A. O. C. S.** H. P. TREVIRICK. *Cotton Oil Press* 7, No. 3, 33-4(1923).—Based on refinings of 3 soy-bean oils by 3 collaborators it is recommended that the Interstate Cottonseed Crushers' Assoc. Rules specify for refining soy-bean oil that (a) one test shall be made using 100% excess of 16° Bé. NaOH soln.; (b) each refining be stirred at least 10 min. cold at 200 r. p. m. before heating. Analyses showing free fatty acid, % refining loss, and color of refined oil are given.

H. S. BAILEY

**Castor oil seeds.** C. D. V. GEORGI. *Tropical Agr.* 61, 53-5(1923).—Analyses of 7 varieties of castor beans are given. Methods of extg. the oil are discussed.

M. S. ANDERSON

**A note relative to the commercial production of palm oil.** M. V. ABBELE. *Bull. agr. Congo Belge* 14, 366-70(1923).—Details of the extn. and purification of palm oil are discussed.

M. S. ANDERSON

**Sesame oil and its possibilities.** C. V. ZOUL. *Cotton Oil Press* 7, No. 5, 33-4 (1923).—A description of the pressing of sesame oil by the expeller followed by hydraulic presses. The advantages of filtering the crude oil through presses precoated with Filter Cel are emphasized. A crude with 3% free fatty acid before such filtration refined with a loss of 10 to 15%. After clarification with Filter Cel the loss was only 4%.

H. S. BAILEY

**Filtrol.** W. KELLY. *Cotton Oil Press* 7, No. 4, 38-9(1923).—Filtrol is a refined silica 3 or more times as powerful a bleaching agent as the standard fuller's earth of the A. O. C. S. Beside its bleaching properties, Filtrol will adsorb H<sub>2</sub>O, free H<sub>2</sub>SO<sub>4</sub>, S compds., and particles in colloidal suspension. It bleaches at a lower temp. than fuller's earth, on some oils at 120° F. For cottonseed 160° is recommended. Dark coconut oils can be bleached with this earth even without the removal of the free fatty acids.

H. S. BAILEY

**Method of determining the detergent action of soaps.** J. W. MCBAIN, R. S. HAR-BORNE AND A. M. KING. *J. Soc. Chem. Ind.* 42, 373-8T(1923).—A method has been developed and standardized for the direct and rapid detn. of the amt. of finely divided C which various soap solns. carry through filter paper. This gives a C no. characteristic of each soln. which may be taken as a measure of the detergent action. It is shown that by a slight alteration of conditions the detergent action of a soap may be greatly increased. There is an optimum concn. in moderate diln. for which the effect is a max.; very slight addn. of either acid or preferably alkali greatly enhances the detergent power. Rise of temp. diminishes rapidly at first, then more slowly, the detergent power; but this may be completely overshadowed by the vital necessity of using sufficiently high temp. to dissolve the soap. Once in soln. there is little difference between soaps as different as myristate and oleate.

E. SCHERUBEL

**Coconut oil.** A. W. ALLEN. *Chem. Met. Eng.* 29, 614-20(1923).—This is an illustrated article describing the operations of a modern plant at Portland, Ore., for producing coconut oil.

E. SCHERUBEL

**Composition of pili-nut oil.** A. P. WEST AND SOFRONIO BALCE. *Philippine J. Sci.* 23, 269-76(1923).—Pili-nut oil is an edible oil from the genus *Canarium*. It has good keeping qualities and the following compn.: olein 59.6, palmitin 38.2, stearin 1.8, unsapon. 0.2%.

E. SCHERUBEL

**Newer investigations on fiber damage by washing- and bleaching-compounds.** W. KND. *Chem.-Ztg.* 47, 457-60, 484-5(1923).—Polemical remarks against the conclusions of P. Heermann (*C. A.* 17, 1891), who condemns the use of washing compds.

contg. active O<sub>2</sub> on account of the alleged destructive action by O<sub>2</sub> on the fiber.

P. ESCHER

**Darco decolorizing carbons.** A. A. JACKSON. *Cotton Oil Press* 7, No. 4, 39-42 (1923).—An address reviewing the development of bleaching carbons and emphasizing the superiority of Darco. A mixt. of Darco with fuller's earth is best for bleaching vegetable oils but with glycerol the char alone is used.

H. S. BAILEY

Recovery of fat in the manufacture of hide glue (DUBOVITZ) 29. Preparation of petroleum from vegetable oils (MAILHE) 22. Decolorizing liquids (Brit. pat. 196,002) 13.

**Fats and fatty oils.** CHEMISCHE FABRIK ASP. Brit. 196,623, Apr. 21, 1923. Low-grade animal and vegetable oils such as cod or other fish oil are purified and otherwise improved by heating *in vacuo* or in the presence of an inert gas such as methane or illuminating gas, in order to distil the fatty acids, etc., volatile below the carbonizing temp., usually 200-300° of the oil. The heating is continued until the oil no longer oxidizes when heated or until the I no. has been reduced to a min. The fatty acids sepd. from the distillate, or their salts, are used for tanning purposes or as a basis for degreas-like substances. The residual fats are used as lubricants and for making soaps, and their sulfonated products for lubricating wool fibers before spinning, as "net" oil for greasing textile fibers, as addns. to vats of indigo and related dyes, and for regenerating soap baths, particularly in conjunction with lime or Mg solns. A typical sulfonated product is obtained by treating cold 1000 g. of fat with 500 g. of H<sub>2</sub>SO<sub>4</sub> of 66° Bé. in the presence of 500 g. of benzine or other solvent inert at the temps. used. The mass is poured into H<sub>2</sub>O with agitation, and the sepd. viscid cake partly neutralized with soda lye and freed from the supernatant benzine.

**Extracting fats.** J. W. PITROCK. Brit. 197,086, Feb. 23, 1922. Fatty matter, such as meat scraps or restaurant garbage, is rendered by agitating in a heated vessel until practically all moisture has been driven off through a small opening and the temp. has risen to about 248° F. Preferably the vessel is steam-jacketed.

**Treating waste waters.** A. J. DE RAEVE. Brit. 197,033, Feb. 7, 1922. Grease and other matter is sepd. from wool-washing or other waste water by successive treatment with alkali, Cl, and acid. Wool-washing waters are treated while fresh and warm with sufficient lime to convert the contained Na carbonate into NaOH, then boiled, and afterwards allowed to cool and settle. The liquid is transferred to a second vat for treatment with Cl. Acid is subsequently added in sufficient quantity to neutralize the hypochlorites formed, and greases and soaps are removed by skimming. The liquid may be finally clarified by filtration through a bed of clinker or sawdust. The recovered grease may be dehydrated by re-emulsifying it with clear water contg. soda in a heated vat fitted with a stirrer, and then allowing sepn. to take place slowly at a temp. slightly above the m. p. of the grease. Liquids from abattoirs can be treated in a similar manner. The sludge obtained in the first stage of the treatment can be worked up with clay or loam for use as fertilizer. NaCl may be added to the liquid in the first vat in sufficient quantity to produce the required amt. of Cl if the liquid is subjected to electrolysis in the second vat. Details of app. are given.

**Extracting oils.** G. R. SCHULER. Brit. 196,799, April 13, 1922. In extg. oils, waxes, etc., from seeds, nuts, etc., by means of a solvent, the finely ground oil-bearing material is continuously fed, by a feeding device fitted with an internal screw, to a mixing cylinder, together with a min. quantity of benzine or other solvent which is pumped in through a pipe. The mixt. passes under pressure into a separator preferably consisting of a cylindrical filter with an internal screw. The meal is steamed to drive off residual solvent and then dried.

**Extracting and purifying oils, etc.** H. BOLIMANN. Brit. 197,429, Feb. 17, 1922. In a countercurrent process for the extn. by solvents of the oils from dust-like substances contained in oil sediments or residues from filter process, or for purifying fats and oils by bleaching earths, the earth or residue from a reservoir and the oil or solvent from another reservoir are alternately conveyed in opposite directions through superimposed compartments of an extn. tower provided with settling vessels having non-return flap valves and with partitions having non-return valves. A suitable construction is specified.

**Purifying oils.** G. J. LEMMENS. Brit. 197,074, Nov. 22, 1921. In refining fatty oils by alkali the oil is atomized into a large bulk of preferably dil. alkali soln. A suitable app. is specified.

**Cacao butter.** T. J. NEILAN and G. W. ZOBANSKY. U. S. 1,467,587, Sept. 11. Cacao butter is mixed with roasted cacao beans to form a batter, the mixt. is digested and ground and cacao butter sepd. from it.

**Glycerol soap.** L. SCHMIDT. Brit. 196,579, Feb. 12, 1923. Anhyd. glycerol and soap powder are obtained by briskly drying moist soap or fat saponified by dry or conc'd. alkali or dry alkali peroxide, and extg. the glycerol with a volatile solvent without action on soap. Solvents specified are  $\text{Me}_2\text{CO}$ ,  $\text{MeEtCO}$ ,  $\text{MeOAc}$ ,  $\text{EtOAc}$ , methylal and abs.  $\text{Et}_2\text{O}$ . In an example 80 kg. of linseed oil are saponified by 25 kg. of 50% soda lye and dried in the boiler at 80–100° under a pressure reduced to 10 mm. The dried mass is ground, and then extd. with  $\text{Me}_2\text{CO}$  for an hr. The faintly yellow glycerol obtained by distg. the  $\text{Me}_2\text{CO}$  from the ext. was bleached by C. The soap remained as a dry white powder.

**Cleansing compositions.** A. L. MOND. Brit. 196,073, Jan. 13, 1922. Detergents are made (1) by digesting products rich in starch, protein, or both, with alkali in the presence of an anhyd. alk. salt capable of taking up a comparatively large quantity of  $\text{H}_2\text{O}$  of crystn.; or (2) by subjecting starch products, etc. to a preliminary heat treatment to render them more permeable to chem. reagents, and digesting the product with alkali in the presence or not of the anhyd. alk. salt. Excess of alkali is preferably used, the unused alkali being neutralized by  $\text{NaHCO}_3$  or other acid salt of an alkali. Soap, or fatty acid of oil and alkali may be added to the product, or fatty acid or soap oil may be added to a freely alk. product. In an example cornmeal is heated to 138° for 1½ hr. in a steam-jacketed mixer. 100 lb. of the meal is then stirred with 35 lb. of  $\text{NaOH}$  made up to a soln. of 40° Bé. in the presence of 100 lb. of  $\text{Na}_2\text{CO}_3$ . 100 lb. of fatty acid or soap oil is added and the mixt. agitated and heated. Coagulicity is removed by stirring in 19 lb. of  $\text{NaHCO}_3$ .

## 28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

**Compounds between sugars and salts. II.** I. M. KOLTHOFF. *Arch. Suikerind.* 31, 799–802 (1923).—Reply to Helderman (*C. A.* 17, 2516). Further expts. at 30° have proved that the sucrose-NaCl compd. is stable at that temp. also, although the stability region is more restricted than at 18°. A diagram is given, showing the concn. limits within which the compd. is stable at both temps. F. W. ZERBAN

**Sugar cane experiments, 1920–22.** J. DE VERTECH and L. A. BRUNTON. *Bull. Dept. Agr. Trinidad and Tobago* 20, 65–109 (1922); cf. *C. A.* 16, 3008.—Fifteen tables are given showing the compn. of varieties of sugar canes grown under different exptl. conditions. K. D. JACOB

**Report on the meeting of the Association of Technical Advisers of the Java Sugar Industry. Joint meeting of the technical and chemical sections.** ANON. *Arch. Suikerind.* 31, Part 4, 51–177 (1923).—A round table discussion regarding the following topics: Shredders and crushers, mill work and mill control, fuel control, losses at the mill station, fuel economy, molasses as fuel, drying bagasse with flue gases, effects of oil in steam and boiler feed water, oil separators, water and steam consumption of presses, defecators, pans, and centrifugals, steam meters, use of syrup for washing in centrifugals, filter press station, use of  $\text{NH}_4\text{P}$  for boiling out pans. F. W. ZERBAN

**The sugar cane project of the Bureau of Agriculture (Philippine Islands).** S. ASUNCION AND M. MEDINA. *Philippine Agr. Rev.* 16, 22–9 (1923).—The record of 5 years' exptl. work with sugar cane at La Carlota Expt. Sta. is given. The data include tonnage yield, sucrose content, and purity of juice. Several varieties of cane were grown. Fertilized crops showed a slight increase in sucrose content and a marked increase in acidity. M. S. ANDERSON

**The preparation of high grade sugar cane syrup.** A. E. COLLENS AND F. H. S. WARNEFORD. *West Indian Bull.* 19, 154–60 (1922).—In expts. on the prepn. of high grade cane syrup a close relation was found to exist between the initial acidity of the juice and the polarization of the finished product. Juices contg. an initial acidity varying from 0.043 to 0.108 cc. of 0.5 N acid per cc. of juice gave syrups with polarizations of 61 to 33°, resp. Juices having an initial acidity of 0.075 cc. of 0.5 N acid per cc., with the time of concn. as 3 hrs., gave the highest grade syrups. Expts. with Filter-Cel as a defecating agent are briefly summarized. K. D. JACOB

**Formation of formic acid by caramelization of cane sugar.** S. G. SIMPSON. *Ind. Eng. Chem.* 15, 1054–4 (1923).—Expts. on the caramelization of cane sugar indicate that

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F. W. ZERBAN

**Compounds between sugars and salts. II.** I. M. KOLTHOFF. *Arch. Suikerind.* 31, 799–802 (1923).—Reply to Helderman (*C. A.* 17, 2516). Further expts. at 30° have proved that the sucrose-NaCl compd. is stable at that temp. also, although the stability region is more restricted than at 18°. A diagram is given, showing the concn. limits within which the compd. is stable at both temps. F. W. ZERBAN

**Sugar cane experiments, 1920–22.** J. DE VERTERUH and L. A. BRUNTON. *Bull. Dept. Agr. Trinidad and Tobago* 20, 65–109 (1922); cf. *C. A.* 16, 3008.—Fifteen tables are given showing the compn. of varieties of sugar canes grown under different exptl. conditions. K. D. JACOB

**Report on the meeting of the Association of Technical Advisers of the Java Sugar Industry. Joint meeting of the technical and chemical sections.** ANON. *Arch. Suikerind.* 31, Part 4, 51–177 (1923).—A round table discussion regarding the following topics: Shredders and crushers, mill work and mill control, fuel control, losses at the mill station, fuel economy, molasses as fuel, drying bagasse with flue gases, effects of oil in steam and boiler feed water, oil separators, water and steam consumption of presses, defecators, pans, and centrifugals, steam meters, use of sirup for washing in centrifugals, filter press station, use of  $\text{NH}_4\text{P}$  for boiling out pans. F. W. ZERBAN

**The sugar cane project of the Bureau of Agriculture (Philippine Islands).** S. ASUNCION AND M. MEDINA. *Philippine Agr. Rev.* 16, 22–9 (1923).—The record of 5 years' exptl. work with sugar cane at La Carlota Exptl. Sta. is given. The data include tonnage yield, sucrose content, and purity of juice. Several varieties of cane were grown. Fertilized crops showed a slight increase in sucrose content and a marked increase in acidity. M. S. ANDERSON

**The preparation of high grade sugar cane sirup.** A. E. COLLENS AND F. H. S. WARREND. *West Indian Bull.* 19, 154–60 (1922).—In expts. on the prepn. of high grade cane sirup a close relation was found to exist between the initial acidity of the juice and the polarization of the finished product. Juices contg. an initial acidity varying from 0.043 to 0.108 cc. of 0.5 N acid per cc. of juice gave sirups with polarizations of 61 to 33°, resp. Juices having an initial acidity of 0.073 cc. of 0.5 N acid per cc., with the time of concn. as 3 hrs., gave the highest grade sirups. Expts. with Filter-Cel as a defecating agent are briefly summarized. K. D. JACOB

**Formation of formic acid by caramelization of cane sugar.** S. G. SIMPSON. *Ind. Eng. Chem.* 15, 1054–4 (1923).—Expts. on the caramelization of cane sugar indicate that

(1)  $\text{HCO}_2\text{H}$  is formed in considerable amounts; (2) the amt. of  $\text{HCO}_2\text{H}$  is governed by the degree of caramelization, which in turn is a function of the temp. and time of heating; (3) food products which are not heated above  $160^\circ$  should produce no appreciable amounts of  $\text{HCO}_2\text{H}$ ; and (4) with a known temp. and time of heating of a food product contg. a known sugar content the amt. of  $\text{HCO}_2\text{H}$  due to caramelization can be approx. estd. The results are shown graphically. C. C. DAVIS

**Some data on root rot in (cane variety) EK 28.** J. M. GEERTS. *Arch. Suikerind.* 31, 711-31(1923).—A careful statistical survey shows that there is no widespread deterioration of EK 28 through root rot. The soil and cultural conditions affecting the prevalence of the disease are discussed in detail. F. W. ZERBAN

**Sugar content and marc content of beets.** K. E. SKÄRBLOM. *Centr. Zuckerind.* 31, 647(1923).—If the marc is mainly cell wall, it must be able to resist the osmotic pressure of the cell contents. The % marc (and hence cell wall thickness) should increase with % sugar. 21 analyses show a general drift from 3.80% marc with 14.1% polarization, to 4.88% marc with 18.5 polarization; in another series 12 analyses range from 4.65% marc with 15.0 polarization to 5.6% marc with 18.6 polarization. Development of high-sugar beets may be contingent on developing high-marc beets. W. L. B.

**Determining per cent sugar in bagasse.** A. H. ALLEN. *Louisiana Planter* 71, 131(1923).—The use of the Spencer rotary digester requires considerable calcn. To simplify this calcn., 100 g. sample, 500 g. water, 5 g. 5%  $\text{Na}_2\text{CO}_3$  soln. are digested 50 min., cooled to room temp., defecated with Horne's dry lead and polarized in a 400 mm. tube. A table for obtaining results is given, in which the % sugar in bagasse is dependent upon the polarization and the % fiber in bagasse. C. H. CHRISTMAN

**Report on mill equipment in Hawaii.** W. V. H. DUKE. *Intern. Sugar J.* 25, 465-7(1923).—Report of the Assn. of Sugar Technologists, Nov. 1922. Figures are given showing the value of shredders in increasing mill extn. However, unless the other equipment of the factory balances that of the mill, the increased extn. does not increase the efficiency of operation. The effect of the Hind Renton grooving of mills on extn. is discussed. Mills of 18 rollers give 3.91% more extn. and 3.93% higher recovery than 9 roller mills. W. L. OWEN

**Increasing diffusion battery capacity.** C. G. LEONIS. *Sugar* 25, 457-9(1923).—Increasing the velocity of the circulating juice and the use of cossets of finer division promote increased capacity at the diffusion station. To avoid a decrease in circulation chains are used to prevent the cossets from packing and to relieve pressure on the screens. Tables are given showing the necessity of filling the battery cell as full as possible and the best manner of obtaining a max. extn. of sugar. Careful control of the amt. of molasses in process will det. the tonnage of beets that can be handled. With careful control the lime kiln may be forced to handle 20% more molasses. C. H. CHRISTMAN

**Pressure evaporators and their importance for steam economy in the sugar factory.** LINSBAUER. *Z. Zuckerind. czechoslovak.* Rep. 47, 574-80(1923).—More complete than Köppl's description (*C. A.* 17, 3427). The Vincik-Turek evaporator body has a number of compartments in the liquor space of a vertical tube evaporator, each with its own downtake, and each downtake discharging into the next compartment. It gives a good circulation and minimizes the effect of elevation of b. p. The installation described operates on steam at  $123^\circ$ ; the vapor temps. in 1st, 2nd and 3rd effects are  $118^\circ$ ,  $112^\circ$ , and  $102-3^\circ$ , resp. Vapors from 1st and 2nd effects go to heaters and the juice boiler; vapors from the 3rd effect go to the vacuum pans. A pressure station is only possible where the pans and heaters can be run on vapors from the evaporator. Installations with a double effect were unsuccessful because they furnished too much vapor to use. The actual av. steam consumption of this factory for the whole campaign was 45 kg. per 100 kg. beets, and individual tests showed 40-41 kg. The evapn. was 8.47 kg. per kg. coal so the actual fuel consumption was 5.3%, a remarkably low figure. W. L. BADGER

**Neutral clarification and how to secure it.** A. H. ALLEN. *Louisiana Planter* 71, 151-2; *Sugar* 25, 485-7(1923).—The presence of amino acids in raw juice causes erroneous values when acidity is measured with phenolphthalein. They also exert a protective action on reducing sugars against lime. Corallin was chosen as a better indicator. When a slight excess of lime causes poor operating conditions in the factory, the use of neutral defecation will be accompanied by a min. lime content in the clarified juice. For the detn. of lime, soap from pure olive oil was used. Organo-siliceous substances, sol. in alk. and alk. earths, are considered the source of trouble. Controlling the acidity with corallin a better operation was secured throughout the factory. C. H. CHRISTMAN

**A comparison of filter press results.** A. H. ALLEN. *Louisiana Planter* 71, 214-5, 232-3, 251-2 (1923).—Scums from the clarification of sugar juices are filter pressed. If the cake is discharged, mixed with water and repressed, it is termed double pressing. The advantage of this has long been questioned. 33% increased filter press capacity is required for double pressing. The purity of the press juice drops less with double pressing and gives a greater rise in the purity of the clarified juice over the raw juice than does the single pressed juice. No decrease in the keeping qualities of the sugars from the double pressed juices was noted. With 39.37% diln. of single pressed juice and 42% diln. of double pressed juice no added objectionable features were caused by the double pressing. Resolution of gums does not occur and it is possible to wash the scum cake to 1% sucrose by adding 100 parts of water to 100 parts of moist press cake. A gain in recovery of 0.25% of the total sucrose is made by double pressing. The cloth consumption is very little larger in double pressing while the increase in filtering area and labor required varies from 30% to 60%. C. H. CHRISTMAN

**Experiments with decolorizing charcoals.** E. SHILLARD. *Fibr. sucr. France* Nos. 1724, 1726, 1728, 1730 (1922); *Biedermann's Zentr.* 52, 88-9 (1923).—Expts. on the decolorization of dil. molasses solns. were carried out with animal charcoal, and 3 vegetable charcoals, Darco, Norit and "Schmidt" charcoal. The decolorizing power of the last was 3 times that of animal charcoal and twice that of Darco and Norit, both at ordinary temp. and at 80°. Heating in an autoclave to 110° gave the best results in all cases and the effect was dependent partly upon the time of heating. At atm. pressure and 20 to 80° temp. decolorization of small amt. of soln. ceased after 10 min. Pressures of 10 atms. did not increase the decolorizing power of the charcoals at 20°. Their efficiency was dependent upon the amt. used and the size of the granules. Animal charcoal absorbed about 10% and "Schmidt" charcoal about 12% of the N compds. present in the molasses. K. D. JACOB

**The use of hydrogen ion indicators in the raw sugar factory.** J. A. GRIBELIN. *Louisiana Planter* 71, 172 (1923).—With  $p_H$  values of 6.7 or higher, sucrose losses are attributable only to heat in factory work. 7.2 was chosen as the  $p_H$  for clarification work as it would avoid inversion losses and decompr. of glucose. The original juice had a  $p_H$  of 5.0, was lined to 7.2, heated to 200° F. in heaters and boiled to a "crack" in defecators. Complete settling of 2750 gals. juice occurred in 30 min. Av. insolubles for the season were 48.1 parts per 100,000 of sugar. The yield of 90% sugar was 259.6 lbs. per ton of cane and the purity of the molasses was 29.4%. C. H. CHRISTMAN

**Compressed air conveyors for the sugar industry.** H. BÄCKER. *Centr. Zuckerind.* 31, 695-6 (1923).—Describes air-conveyors for dried pulp. Vertical lifts up to 30 m. offer no difficulty. Air velocities should be under 25 m. per sec. One installation handles 96 metric tons chips daily, with 45 h. p. and a total resistance of 200 mm.  $H_2O$ . WILHELM POLEWKA. *Ibid* 794.—Another plant handles 3750 kg. chips per hr. through a conduit 79 m. long, 300 mm. diam., with 3 turns, and uses 9.5 h. p.

W. L. BADGER

**Movement of juice and calculation of steam consumption for heating, evaporating, and graining in a raw sugar factory.** GUSTAV GLASER. *Centr. Zuckerind.* 31, 730-2 (1923).—Assume 100 kg. chips yield 110 kg. raw juice of 18° Bx., 115 kg. thin juice of 16.2° Bx., which is evapd. to 31 kg. thick juice of 60° Bx., 95 purity. 10.3 kg. of green syrup of 60° Bx. and 75 purity are drawn into the first pan with the thick juice, boiled to 26.4 kg. 1st filtmass of 94° Bx. and 90 purity. From this is obtained 17.2 kg. raw sugar and 9.2 kg. of green syrup, which is dild. with 4 kg.  $H_2O$  to 13.3 kg. green syrup. After returning 10.3 kg. to the 1st pan, this leaves 3 kg. for the 2nd pan, which is boiled to 1.9 kg. 2nd filtmass of 6%  $H_2O$ . This yields 0.77 kg. 2nd sugar and 1.29 kg. molasses. The battery is heated by the direct injection of 4.2 kg. live steam. The evaporators are heated on exhaust. The 1st effect heats the thin juice heaters and both pans. The 2nd effect heats the carbonated juice heaters and the 2nd raw juice heaters. The 4th effect heats the 1st raw juice heaters. This calls for a total consumption of 43.5 kg. of exhaust, or a total of 47.80 kg. steam per 100 kg. beets. If this much exhaust is not available, a juice boiler should be installed, heated by live steam, and sending its vapors to the 1st effect with what exhaust is available. On an assumption of 30 kg. exhaust to the 1st effect with what exhaust is available. On an assumption of 30 kg. exhaust, this calls for 9.58 kg. to the juice boiler or a total of 47.17 kg. steam per 100 kg. beets. W. L. BADGER

**The lime kiln in the sugar factory.** W. MONTGOMERY. *Sugar* 25, 404 (1923).—A pure limestone with 96-89%  $CaCO_3$  should be used. Coke should be low in Sand P. The rock requirements are 7.5-10% of the beets worked and the coke 0.5-0.8% on beets. For 1000 tons of beets a kiln 70 ft. high, 12 ft. diam. at the bottom and 10 ft. at the top is required. Slag formation by silica in the kiln must be avoided through

the use of slice bars through the port holes, with red lead, or by removing the charge as C. H. CHRISTMAN  
as last resort.

**The Hinton Marsden grooving of mill rollers.** ROBT. HARVEY. *Intern. Sugar J.* 25, 462-3(1923).—This grooving is in the form of right and left hand spiral grooves of V-shaped cross section, with a depth of  $\frac{1}{4}$  in. and having an angle of  $60-5^{\circ}$  at the bottom of the V. The advantages of the grooving are: an increased grip, greater milling capacity, a quieter running of the mills, and less wear on rolls, owing to the elimination of slips. Rollers may also be constructed of harder and closer grained metal. Tests of the extn. obtained by the use of mills provided with this type of grooving showed an increase of 2.9%. W. L. OWEN

**Manufacture of distilled and molasses vinegar (ARNSTEIN) 16.** The utilization of the potato (GORE) 12. Experience in Java with mixtures of bagasse and trash as fuel (ANON.) 21. The white louse (KUYPERS) 15. Decolorizing liquids (Brit. pat. 196,002) 13.

**Treating a raw sugar.** W. HULME and D. A. BLAIR. Brit. 195,780, Jan. 12, 1922. Raw sugar, especially of the sort known as gur, jaggery, zebu and ilo-ilo, is melted by the combined action of heating fluid and stirring arms, and freed from impurities by settling or in a centrifugal. The melting takes place in a pan having rotary, hollow, perforated arms, through which steam or other heating fluid can be introduced, interacting with fixed arms or arms rotating in the opposite direction. A suitable construction is specified.

**Treating sugar cane.** W. GREVEKE. Brit. 196,224, Sept. 1, 1922. Sugar cane is crushed or shredded so as to sep. the fibers without tearing them to pieces, treated with steam or hot  $H_2O$ , and pressed in plunger presses at a pressure of about 10,000 lbs. per sq. in., leaving a bagasse, contg. about 25% of  $H_2O$ , and suitable for fuel.

**Sugar syrup.** H. C. GORE. U. S. 1,467,599, Sept. 11. Cane syrup is heated to about 50-60° and mixed with 0.02% yeast and the temp. of the mixt. is maintained at about 50-60° for 15-60 hrs. and then raised to the b. p. to produce a non-crystallizable syrup.

**Sirup from sucrose.** C. F. WALTON, JR. U. S. 1,465,459, Aug. 21. A sucrose-contg. soln. such as an intermediate refinery product is treated with invertase free from all other sucrose-attacking enzymes, to effect partial inversion of the sucrose and prep. a sirup which may be thickened by boiling and evapn. without crystn.

**Diffusion apparatus adapted for extracting sugar from beets.** W. C. GRAHAM. U. S. 1,467,849, Sept. 11.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**Progress in the leather industry in 1922.** R. LAUFFMANN. *Gerber* 49, 65-6, 75-7, 81-2, 92, 101-3, 109-10(1923).—A review with bibliography. H. B. MERRILL. **Second report of the French commission on leather analysis.** PAUL CHAMBARD. *J. Soc. Leather Trades Chem.* 7, 353-61(1923).—See *C. A.* 17, 3262. E. J. C.

**The judgment of leather on the basis of its specific gravity.** LUDWIG JABLONSKI. *Z. Leder-Gerberei-Chem.* 2, 173-7(1923).—Winandy's (*Leder-Tech-Rundschau*) proposal to judge leather on the basis of its sp. gr. is disputed. In working on this basis, consideration must be given to the fat content of the leather. It is also suggested that if leather were sold on this basis, it would be an invitation for tanners to cut quality and load their leathers. ERWIN J. KERN

**The resistance of various leathers to acids.** W. MÖLLER. *Z. Leder-Gerberei-Chem.* 2, 179-85(1923); cf. *C. A.* 16, 2617.—Leathers tanned with synthetic tanning materials and with mixts. were treated with  $HCl$ ,  $H_2SO_4$ , and  $CH_3COOH$ . After treatment the liquor was filtered off and the hydrolytic products calcd. from the N content of the filtrate. No relation exists between hydrolysis of collagen by acids and their power to disperse the insol. tannins. The degree of hydrolysis of the collagen in the tanned leathers is not entirely a function of the dissociation of the acid used. ERWIN J. KERN

**A suggested new method for the disinfection of hides and skins for anthrax.** H. F. SMYTH AND E. F. PIKE. *J. Am. Leather Chem. Assoc.* 18, 541-57(1923).—Studies were made of the actions of  $Cl_2$ ,  $Br_2$ ,  $I_2$ ,  $HCl$ ,  $COCl_2$ ,  $CCl_4$ ,  $SO_2$ ,  $NH_3$ , and  $CHCl:CCl_2$

upon skin infected with anthrax. Of these, iodine proved to be the most promising, from a practical viewpoint, for the disinfection of skin. Used under the right conditions, iodine renders the skins quite sterile without injury to their leather-forming properties. It may be used as vapor or dissolved in water or some org. solvent.

J. A. WILSON

**Attempt to determine the tannin irreversibly fixed in the residual hide powder from the determination of non-tans by the official method.** A. JAMET. *Cuir* 15, 423-4(1923); *J. Soc. Leather Trades Chem.* 7, 400-10.—A sample of chromed hide powder which had served for detannizing a soln. of a tanning ext., in the detn. of non-tans, was washed, dried, and weighed, as in the Wilson-Kern method. Owing to the high proportion of hide substance to tannin, the powder underwent hydrolysis, and the results were meaningless.

H. B. MERRILL

**Determination of non-tans in tanning materials by the modified shake method.** BALDRACCO AND S. CAMILLA. *Cuir* 15, 395-6(1923); *J. Soc. Leather Trades Chem.* 7, 380-2.—Poleneical.

H. B. MERRILL

**Damaged calf skins.** JOVANOVITS. *J. Soc. Leather Trades Chem.* 7, 376-9(1923). An investigation of damaged grain on certain kinds of box-calf leather showed the trouble to be caused by the action of urine upon the skins of the living animals. Greater care and cleanliness in the stalls of the animals is recommended.

J. A. WILSON

**Further observation on the histology of bated skins.** RÖHM AND HAAS CO. *J. Am. Leather Chem. Assoc.* 18, 516-24(1923).—A series of 6 photomicrographs is given showing the condition of the elastin fibers of goat skin: (1) after soaking; (2) after 4 days in an old lime liquor; (3) after a further period of 8 days in a fresh lime liquor; (4) after unhauling and washing; (5) after bathing 2 hrs.; and (6) after bathing overnight. While the elastin fibers undergo some changes in the various processes, they are not entirely removed, even by the bathing process used. It is questioned whether elastin removal is the most important function of bathing.

J. A. WILSON

**A study of the processes involved in tannin analysis.** G. W. SCHUTZ. *J. Am. Leather Chem. Assoc.* 18, 524-32(1923).—Expts. were made upon gallotannin twice reprecipitated by the method of Paniker and Siashny (*C. A.*, 6, 629), neutralizing with  $\text{NaHCO}_3$  and extg. with ethyl acetate. Unchromed hide powder was shaken with aliquots of tannin solns. for 1 hr., let stand for 16 hrs. and again shaken for 1 hr. The amt. of tannin combined with the hide powder was calcd. from the decrease in concn. of solid matter of the soln., allowing for dissolved nitrogenous matter. In the strongest solns. used, practically all of the tannin combined with the hide powder. When 12 g. of hide powder in combination with 4.6 g. of tannin was washed with 20 changes of 200 cc. water each, 0.2 g. of solid matter was dissolved; this was considered evidence of partial hydrolysis of the hide-tannin compnd.

J. A. WILSON

**Comparative tannin analysis.** H. C. REED, et al. *J. Am. Leather Chem. Assoc.* 18, 535-7(1923); cf. *C. A.* 17, 2520.—Discussion of committee report.

J. A. WILSON

**Analysis of chromium compounds in tannery practice.** FRANZ KAHNÄUSER. *Gerber* 49, 89-92, 103-6(1923).—A critical review of the various methods for the estn. of Cr. K. concludes that the  $\text{FeSO}_4$  method gives results as satisfactory as the iodometric and that persulfate is preferable to peroxide as an oxidizing agent. Details of procedure are given for estn. of Cr in various tannery materials.

H. B. MERRILL

**Black wattle bark industry in South Africa.** C. W. WILLIAMS. *Tropical Agriculturist* 60, 19-35(1923).—Wattle bark contains an av. of 33% tannin. At 30° about 90% of this is extractable. The liquors show a loss of only about 2% tannin on standing 60 days.

M. S. ANDERSON

**The tannin of wild cherry bark.** J. C. AND B. L. PEACOCK. *J. Am. Pharm. Assoc.* 12, 774-81(1923).—Gallic acid is not present. Cold  $\text{H}_2\text{O}$  exts. only a part of the tannin, a portion remaining as  $\text{H}_2\text{O}$ -insol. phlobaphene. The tannin is the Fe-greening kind, which yields a red phlobaphene by the action of acids. Free  $\text{C}_6\text{H}_5\text{COOH}$  is present.

L. E. WARREN

**Some tanning barks of Madagascar.** F. HEIM AND M. CERCELET. *J. Soc. Leather Trades Chem.* 7, 381-5(1923).—See *C. A.* 17, 3262.

E. J. C.

**Tannin-containing acacias.** GOFFART. *Cuir* 12, 430-33(1923).—Botanical characteristics are given of various species of acacia which contain tannin. H. B. M.

**Suppression of collagen losses during depilation.** WILHELM RAUTENSTRAUß. *Halle aux cuirs* No. 7, 204-6(1923).—The quantity of hide substance dissolved by a fresh  $\text{Ba}(\text{OH})_2$  soln. can be reduced by employing a soln. satd. with protein and sterilized with creosote.

H. B. MERRILL

**Thioaldehyde tanning.** W. MÖLLER. *Z. Leder-Gerberei-Chem.* 2, 177-9(1923).—

Two methods are given for the prepn. of thioaldehyde: (1) treatment of HCOH with HCl and H<sub>2</sub>S, (2) treatment with Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> and HCl. The milky mass in either case is dissolved in an alk. soln. It is thought that thioaldehyde deposits itself on the hide-fibers the same as S.

ERWIN J. KERN

**Synthetic tanning materials.** T. BLACKADDER, *et al.* *J. Am. Leather Chem. Assoc.* 18, 537-41(1923).—Discussion of possible committee work for the future.

J. A. WILSON

**Lime liquors; first general report of the limeyard control committee of the British Section of the S. L. T. C.** F. C. THOMPSON, *et al.* *J. Soc. Leather Trades Chem.* 7, 394-406(1923).—In a systematic control of lime liquors, it is desirable to be able to measure the depilatory, plumping, and proteolytic powers of the liquors and also their power to remove fats from the skin. Of the many detns. outlined and discussed, the committee recommends the following for control purposes: (1) caustic alky., (2) ammonia, (3) sulfides, (4) total N, (5) amino groups and degree of hydrolysis of protein matter, (6) swelling power by direct test, (7) temp.

J. A. WILSON

**Recovery of fat in the manufacture of hide glue.** A. DUBOVIRZ. *Z. deut. Oel-Fett-Ind.* 43, 558-9(1923).—Numerous analyses of the lime-wastes from glue factories gave the following results: H<sub>2</sub>O 37-58%, free fat 1.89-9.06, combined fat 8-12.6, N dry basis 1.41-2.63%, P<sub>2</sub>O<sub>5</sub> traces. Industrially the fat is extd. by benzine or benzene, after the CaCO<sub>3</sub> has been neutralized by means of 25-75% H<sub>2</sub>SO<sub>4</sub> soln.; this addn. usually dries the material sufficiently for extn. by the formation of CaSO<sub>4</sub>. The fat in the extd. residue is less than 3%, and the residues may be used as fertilizer.

P. ESCHER

**Substitute for leather (Brit. pat. 196,095) 30. Artificial fibers, films or imitation leather (U. S. pat. 1,464,949) 23.**

**"Artificial leather."** R. B. RESPES. U. S. 1,465,092, Aug. 14. A woven or felted fabric is coated with a "liquid cellulose" dressing while the fabric is maintained under tension, the dressing is frictioned and spread on the fabric, and, after application of successive coatings by repeating this treatment, the fabric and coatings are subjected to pressure. Cf. *C. A.* 16, 2428.

**Attaching rubber to leather.** FARBFABRIKEN VORM. F. BAYER & Co. Brit. 195,635, March 28, 1923. Rubber is attached to leather by vulcanizing with the aid of an accelerator such as described in 11,530, 1913 (*C. A.* 8, 3635), 11,615, 1923 (*C. A.* 8, 3635) 12,777, 1913 (*C. A.* 8, 3723) or 12,664, 1914, or in the absence of an accelerator, the heat of vulcanization being as high as compatible with the safety of the leather. The leather may be protected by interposing a sheet of asbestos, etc., between it and the press plate, or the rubber may be heated by lower pressure steam, and the leather by lower pressure steam, or not at all. The joint is improved by roughening it with rubber soln. The invention is directed chiefly to the manuf. of soles, etc., of foot wear, but is applicable to other purposes.

**Treating leather; rubber.** A. H. SHAW, N. B. ROY and J. ATKIN. Brit. 196,360, Jan. 19, 1922. Leather has applied to it a coating or thin sheet of rubber or rubber compd. which is then vulcanized by the "Peachey" process. The product may be finished by the application of oils, varnishes, shellac, etc. The rubber may be in the form of latex. The following examples of rubber compds. are given: (1) plantation crêpe rubber, lithopone, celestial blue; (2) plantation crêpe rubber, leather buffings, lithopone, ultramarine. Cf. 129,826.

**Plumping chrome-tanned leather.** J. L. ROBINSON. Brit. 198,288, Oct. 26, 1922. See Can. 230,859 (*C. A.* 17, 2372).

**Tanning fish skins.** E. KNUDSEN. U. S. 1,467,858, Sept. 11. See Brit. 165,199 (*C. A.* 16, 659).

**Depilatories.** P. KAIZER. Brit. 195,730, Jan. 3, 1922. One part of resorcinol is rubbed with 50 parts of glycerol in a mortar and gradually 100 parts of distd. H<sub>2</sub>O are added during the mixing. The mixt. is applied to the skin by means of a piece of cotton wool and the skin then rubbed with a piece of pumice stone.

**"Cold glue" from blood.** F. LUX. U. S. 1,468,313, Sept. 18. Fresh blood is treated with oxalic acid or Na citrate and evapd. *in vacuo* at a temp. which does not cause coagulation. The dry residue is then dissolved in H<sub>2</sub>O to form a glue adapted for gluing wood.

## 30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

**Determination of total sulfur in rubber goods.** S. COLLIER, MICHAEL LEVIN AND R. T. MEASE. *Ind. Eng. Chem.* **15**, 953-5(1923).—The method of Waters and Tuttle for the detn. of total S (cf. Bureau Standards, *Tech. Paper* 174; *C. A.* **6**, 1540) is modified to shorten the time without detracting from the accuracy. The sample (0.5 g.) is treated with 15 cc. of  $HNO_3$ -Br mixt., evapd. to dryness, 3 cc. of  $HNO_3$  + 5 g. of  $Na_2CO_3$  added, the product dried and fused, the fused mass lixiviated with  $H_2O$ , filtered, the filtrate acidified with HCl, dild. to 300 cc. and the S detd. by the usual method. A comparison of this method with that of Kratz, Flower and Coolidge (cf. *India Rubber World* **62**, 356(1920); *C. A.* **14**, 1907) by pptg.  $BaSO_4$  from solns. contg. the equiv. amt. of salts usually present, with varying amts. of  $Na_2SO_4$  showed that the occluded salts must be corrected for in accurate work with both methods (cf. *C. A.* **4**, 1955; **5**, 2456; **15**, 594). The % occlusion is greater for small amts. of S in the K., F. and C. method, but from the practical point of view, there is little difference in the 2 methods. Detn. of S in compds. contg. PbO and  $BaSO_4$  showed that the new method gives after correction for occlusion slightly low, and the K., F. and C. method slightly high, results, though the errors are so small that both can be considered accurate.

C. C. DAVIS

**Tripeteir gutta-percha plantation.** ANON. *India Rubber World* **68**, 777-8(1923). A description of the prepn., by mech. means, of gutta-percha from the leaves of plantation *Palauium* shrubs. This leaf gutta-percha shows a lower resin content and a higher tensile strength than other sorts.

G. S. W.

**The amount of acid in latex coagulation.** O. DE VRIES. *India-Rubber J.* **65**, 763-5(1923).—Some new data obtained concerning the influence of diln. and of the degree of natural acidity of latex on the proportion of acetic, sulfuric, hydrochloric, and nitric acids required for coagulation do much to explain apparent discrepancies in the results of previous workers. (Cf. Eaton, *C. A.* **7**, 3035; Parkin, *C. A.* **7**, 3036; *India-Rubber J.* **64**, 945.)

G. S. W.

**Practical testing of crude rubber.** O. DE VRIES. *India Rubber World* **68**, 779-80 (1923).—A discussion of the sampling of raw rubber, of the significance of analytical figures for it and of tests for uniformity of rate of cure.

G. S. W.

**Addition of compounding ingredients to rubber latex.** C. C. LOOMIS AND H. E. STUMP. *Chem. Met. Eng.* **29**, 540-2(1923); *India Rubber World* **68**, 763-5(1923). The occurrence of coagulation on the addn. of fillers to latex may be due to any of 3 causes, viz. (1) the absorption of a large proportion of the serum water by the filler, (2) a sufficient positive charge on the filler particles, (3) partial solv. of the filler, giving rise to a sufficient concn. of a coagulating ion. General lines on which difficulties arising from these 3 causes may be met are, resp., as follows: (1) the material (e. g., clay, whiting, talc, silica) is satd. with water before being added. (2) Additional protective colloid is introduced to the latex. (3) As with (2), or the coagulating ion is pptd. Irreversible water-sol. colloids, e. g., colloidal silicic acid, can be readily mixed with latex, but usually tend to modify greatly the properties of the rubber obtained from the latex in question. Glue and casein can readily be mixed with latex, but greatly alter the properties of the rubber. In order to introduce oils, it is best to emulsify them first. A mixt. of such an emulsion and latex, when first pptd., shows that the oil has not dissolved in the rubber. Liquids, such as  $C_6H_6$ ,  $PhNH_2$ , and  $CS_2$ , which would ordinarily coagulate latex, can be mixed with it if first emulsified. Starch and viscose can readily be mixed with latex. The vulcanization of rubber in latex is discussed.

G. S. WHITBY

**Selenium in rubber compounding.** I. WILLIAMS. *Ind. Eng. Chem.* **15**, 1091-21 (1923).—The solv. of Se in rubber is low (less than 0.05% at 80°). The element may be conveniently distributed in rubber by adding it along with S in the form of a fused mixt. with the latter. Although Se alone will not bring about vulcanization, its presence will accelerate vulcanization by S. Thus, a mixt. of 94 pts. rubber with 5.11 S and 2.19 Se cured approx. twice as fast as a mixt. of 94 pts. rubber with 6 pts. S. Little or no Se combines with the rubber. It is difficult to ext. uncombined Se by means of  $Me_2CO$  after all free S has been removed.

G. S. WHITBY

**Poisson's ratio and related properties for compounded rubber.** W. W. VOOT AND R. D. EVANS. *Ind. Eng. Chem.* **15**, 1015-8(1923).—The following compounding ingredients lead to anisotropy (recognized by a difference in Poisson's ratio in different directions): graphite, mica, tripoli, clay, light Mg carbonate, glue. The following have

no such effect: gas black, lampblack, iron oxide, ZnO, lithopone, barytes. Materials in the first group also lead to differences in (a) vol. increase under strain, (b) stiffness of the stress-strain curve, (c) permanent set when rubber contg. them is compared in the three directions—with, across, and vertical to the calender grain. Such anisotropic effects are dependent upon the particle shape of the substances in question. G. S. W.

**Accelerators of vulcanization.** G. S. WHITBY. *Ind. Eng. Chem.* 15, 1005-8 (1923).—A critical review of the question of the mode of action of accelerators is given. New data show the potency of piperidinium pentamethylenedithiocarbamate as an accelerator. G. S. W.

**Influence of bases on the activity of vulcanization accelerators.** G. S. WHITBY AND A. CAMBRON. *J. Soc. Chem. Ind.* 42, 333-6T (1923).—In expts. on rubber cements it is found that the introduction of bases strikingly hastens vulcanization in the presence of accelerators, the optimum effect being obtained when the amt. of base added is approx. that equiv. to the acid content of the rubber (cf. following abstr.). The introduction of soaps also hastens vulcanization. And the effect of bases is ascribed to the dispersing action of soaps formed from the resin acids. The formation of resin soaps is probably also a factor in the mode of action of certain accelerators, such as piperidinium and ammonium dithiocarbamates and such as caustic alkalies. G. S. W.

**Acidity of raw rubber.** G. S. WHITBY AND A. R. WINN. *J. Soc. Chem. Ind.* 42, 336-9T (1923).—The acetone ext. of raw rubber contains a high proportion of free acid. Data given show that the amt. of acid present varies considerably in different samples, even if the samples are of the same type. Thus, 8 samples of smoked sheet ranged from 236 to 289 mg. in regard to the KOH required to neutralize the acid extd. from 100 g. of rubber. Some crêpes belonging to the lower plantation grades showed very low acid numbers, a figure of 92 being found in one case. It is considered probable that variation in resin-acid content is a factor in the variation of rubber samples in vulcanizing behavior. In tests in which dry raw rubber was treated with alkalies, no deterioration took place as a result of the treatment. G. S. W.

**A laboratory burning test for accelerators.** S. M. CADWELL AND O. H. SMITH. *India Rubber World* 68, 782-3 (1923).—Films, deposited from a cement of rubber (100), ZnO (10), S (3), and such an amt. of accelerator as would give a tensile strength of 2800-3000 lb./in.<sup>2</sup> in a 60-min. mold cure at 40 lb. steam, are heated in a stream of CO<sub>2</sub> at 212, 230, or 248° F. for 10, 20, 30, 40, or 50 min. The condition of the films is then examd. qualitatively. An accelerator which would produce premature vulcanization on the mill (burning) will give a distinct cure in 30 min. at 212° F., and one which would not burn badly on the mill no distinct cure in 50 min. at 248° F. Results with several accelerators are quoted. G. S. WHITBY

**The value of rubber pigments. II, III.** D. F. TWISS. *India Rubber J.* 65, 651-6, 693-8 (1923); cf. C. A. 17, 2204.—A review and description of the properties and effects of various ingredients with new data. Emphasis is laid on the importance of particle size of compds. and expts. illustrate this influence in certain cases. Pptd. BaSO<sub>4</sub> gave much higher tensile strengths than barytes, and used in equal vols., gas black, special refined clay, lampblack, ZnO, china clay, whiting and pptd. BaSO<sub>4</sub> imparted tensile strengths decreasing in the order given. Light calcined MgO is a more active accelerator than heavy MgO, the difference being attributed to the smaller particle size of light MgO. The greater activity of yellow PbO compared with brown PbO is demonstrated by expt. and is ascribed to the difference in solv. in rubber. Comparative tests with neutral ZnO and ZnO contg. ZnSO<sub>4</sub> showed that the rubber compd. contg. the latter attained its optimum cure only after the former was badly overcured. Expts. with As<sub>2</sub>S<sub>3</sub> showed it to have considerable accelerating activity, but this activity was diminished by ZnO. C. C. DAVIS

**Starch of *Hevea brasiliensis* (BOBILLOP) 11D.** Rubber (Brit. pat. 196,360) 29. Attaching rubber to leather (Brit. 195,635) 29. Apparatus for preparing combustion gases and air for drying latex (U. S. pat. 1,466,443) 1.

**Rubber.** W. F. RUSSELL. Brit. 196,924, April 25, 1923. The vulcanization of rubber mixts. contg. S and an oxide of a metal, such as Zn, Pb, Al, or Mn, is improved by the addn. of substances which promote the dissolution of the oxide in the rubber. Suitable substances are acids whose Zn salts are sol. in hot aromatic hydrocarbons, such as benzene or xylene, or in terpene hydrocarbons, such as pyridine or piperidine. Examples of such acids are the monobasic satd. and unsatd. fatty acids, particularly the higher members such as lauric, palmitic, stearic, oleic, and linoleic acids; aryl derivs. of fatty

acids, such as phenylacetic, phenylpropionic, and cinnamic acids; aromatic monobasic acids, such as benzoic and tolue acids; certain derivs. of aromatic monobasic acids, such as the alkoxybenzoic acids, e. g., anisic acid and acid resinous substances, such as colophony, Burgundy pitch, and Venice turpentine. Derivs. of these acids, such as their salts of Zn, NH<sub>3</sub>, or org. bases, or their double salts of Zn and NH<sub>3</sub> or an org. base, may also be used, and if the Zn salts be employed the ZnO may be omitted from the mix. The action of the acids is usually enhanced by the presence of org. bases or base-generating substances, such as the usual accelerators, particularly urea. The substances may be added to the rubber either on the mill with the other compounding ingredients, or during the creping or sheeting operation, or they may be mixed with the latex before coagulation either in the free state or in the form of glycerides which are decomposed by enzymes in the latex.

**Dental rubber.** T. A. SCHWARTZ and E. F. ORTMAYER. Brit. 197,757, Feb. 25, 1922. A vulcanizable compn. sufficiently hard and tough for making dental base plates, and of a color corresponding to that of the human gums comprises rubber, S, and compounding and coloring ingredients, the proportion of S being not more than  $\frac{1}{2}$  nor less than  $\frac{1}{4}$  of the rubber, and the remaining ingredients less than double the rubber. A suitable compn. contains rubber 32, S 10, lithopone 48, and vermillion 10%.

**Metalized rubber.** A. I. G. WARREN. Brit. 196,063, Jan. 12, 1922. A metal surface is obtained on rubber articles contg. S by producing a sulfide by combination of a metal with the S in the rubber, and subsequently reducing this sulfide. Au and Ag are the most suitable metals, but Zn, Ni, Sn, etc., may also be employed. The surface of an unvulcanized or partly vulcanized article is coated with metal by applying foil to the surface of a mold, or metal dust to the mold or article; or the metal salt or oxide, made into a paste with a volatile medium, may be employed in the same way, and the volatile medium evapd. The article is heated to complete the vulcanization and to convert some of the metal or salt into sulfide. Unconverted metal is stripped off and the sulfide is reduced to the metal by suitable means such as an electrolytic treatment. Suitable electrolytic baths, etc., are (a) a satd. soln. of NH<sub>4</sub>NO<sub>3</sub> in which the article is heated for 6 sec. at 5 v., (b) 8 oz. of Cu cyanide in 1 gal. of H<sub>2</sub>O, 2-3 v. for 10 min. or longer if a Cu surface is required, (c) 1 lb. of CuSO<sub>4</sub> and  $\frac{1}{2}$  oz. of H<sub>2</sub>SO<sub>4</sub> in 1 gal. of H<sub>2</sub>O with a potential difference of  $\frac{1}{2}$  v. The resulting metallic surface is burnished and may receive a further coating by electrodeposition.

**Boots, etc.** R. SURRIDGE. Brit. 198,239, June 27, 1922. Rubber soles and heels for footwear are composed of an outer layer of vulcanized rubber, preferably uncured, and a backing layer of unvulcanized rubber mixed with about 10% of S and about 1% of C which becomes vulcanized by the heat and pressure to which it is subjected during use. The sole is attached to the boot by means of a soln. of hard para-rubber in a mixt. of equal proportions of CCl<sub>4</sub> and C<sub>2</sub>HCl.

**Rubber cement.** H. A. COOK. U. S. 1,407,356, Sept. 11. Pure rubber 8 lbs. is dissolved in C<sub>4</sub>H<sub>6</sub> to make about 10 gals. of soln., combined with a soln. of 4 oz. shellac in 3 pints alc., a soln. of white resin in 3 pints alc., 8 oz. of sassafras and 8 oz. ether.

**Treating rubber, etc.** J. C. KOELLER. Brit. 198,097, Feb. 25, 1922. The resiliency of vulcanized rubber, etc., is restored, preserved or enhanced, or the plasticity of unvulcanized rubber is increased by treatment with C<sub>2</sub>H<sub>2</sub>. Perished vulcanized rubber is comminuted and washed with water or caustic soln. to remove impurities and swell the rubber, and is then placed in an atm. of C<sub>2</sub>H<sub>2</sub> for about 2 weeks, and is finally washed with hot H<sub>2</sub>O. The resulting powder is capable of revulcanization. The resiliency of rubber articles is restored or increased by the same treatment. Raw rubber is first treated to swell it and is then immersed in the C<sub>2</sub>H<sub>2</sub>.

**Vulcanizing rubber.** NAUGATUCK CHEMICAL Co. Brit. 197,632, July 12, 1922. The reaction product of an open C chain aldehyde having more than 2 and less than 8 C atoms in the chain, and NH<sub>3</sub> is used as an accelerator in the vulcanization of rubber, etc. Suitable aldehydes are heptaldehyde, propionaldehyde, cinnamaldehyde, iso-valeraldehyde. E. g., 100 parts of rubber, 10 parts of ZnO, 3 parts of S and 0.5 part of the reaction product are mixed and vulcanized at 40 lbs. steam pressure in 60 min. The process described in 174,915 (C. A. 16, 1887) may also be employed as follows: 100 parts of rubber are milled with 10 parts of ZnO, 3 parts of S and 3 parts of heptaldehyde, and the mix is exposed to NH<sub>3</sub> for 60 min. at 50°. Cf. 7,370,1914 (C. A. 9, 2468) and 180,978 (C. A. 16, 3557).

**Vulcanizing rubber.** W. F. RUSSELL. U. S. 1,467,197, Sept. 4. Uniformity of rubber compns. vulcanized with S and ZnO is promoted by the addn. of palmitic, stearic, phenylacetic or other org. acids to promote dissolution of the ZnO throughout the rubber and produce strong and well vulcanized products.

**Vulcanizing treads on rubber tires.** W. M. JONES, JR. U. S. 1,467,761, Sept. 11. Mech. features of controlling heating in vulcanizing treads on previously formed tires.

**Substitute for leather, etc.** C. R. COLLYER. Brit. 196,095, Jan. 17, 1922. Kapok is mixed with rubber, etc., preferably in the proportions of 1-4 parts by wt. of kapok to 8 parts of rubber, the mixt. is shaped or sheeted and vulcanized, preferably under mech. pressure.

